Reinventing Government

The National Performance Review

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Cadastral Survey Reinvention Laboratory

Executive Summary and Final Report

September 29, 1995

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National Performance Review

Project Charter

Cadastral Survey Reengineering

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April 1994

Department of the Interior
Bureau of Land Management

Project Charter

Cadastral Survey Program Reengineering

I. Vision Statement

Support the Nation's need for cadastral surveys, land records, and spatial land information through leadership, innovation, technology, and a commitment to excellence.

II. Reengineering Goal

Reengineer Cadastral Survey business processes in order to achieve significant improvements in cost reductions, services, and speed of delivery of products and services to clients without loss of quality.

III. Business Objectives

- Conduct a staged reengineering of existing Cadastral Survey & GCDB processes, functions, products & services, and examine the relationships of processes with other BLM programs and other agencies to increase efficiencies and customer satisfaction.

Phase I	Conduct a staged reengineering of cadastral survey and GCDB processes, functions, products and services.
Phase II	Look at the interrelationships between Cadastral Survey and Mapping Sciences/Geographic Sciences and reengineer to achieve goals.
Phase III	Examine the interrelationships between Cadastral Survey BLM, and other agencies and reengineer to achieve goals.

- Identify additional customers, products and/or services for Cadastral Survey to provide clients.
- Establish processes and available resources for acceptance of all funded survey requests.
- Establish processes and available resources to meet agreed upon deliverables and delivery dates of clients.
- Maintain stewardship for all cadastral data.

IV. Phase I Project Objectives

- Establish measuring mechanisms for project success.
- Improve overall survey delivery by decreasing the maximum time period from the survey completion date to approval within 90 days, by FY 97.
- Integrate automated techniques and processes in the cadastral process by the end of FY 96.
- Identify opportunities for marketing products and services to clients.
- Identify existing statutes, laws, regulations, and policies that will constrain the reengineering process.
- Identify resources and processes to eliminate the backlog of existing survey returns by the end of FY 97.
- Produce a Bureau-wide analysis model and design partitioning for Cadastral Survey.
- Produce implementation action plans and schedules of reengineered Cadastral Survey process Bureau-wide.

V. Resources

- Department of the Interior National Performance Review Team.
- BLM National Performance Review Team.
- All cadastral personnel.
- Respective State Office personnel.
- Brian Dickinson/Logical Conclusions, Inc.
- Customers
- Professional Societies
- Academia

VI. Constraints

- Phase I reengineering scope to include only those processes currently inclusive to Cadastral Survey.
- Funding for reengineering to be accomplished within existing cost targets.

VII. Identified Phase I Business Events

A. Surveys

- Original Survey Request
- Resurvey Request
- Mineral Survey Application

B. Land Tenure Systems

- Supplemental Plats Requests
- Protraction Diagrams Requests

C. Geodesy

- GPS Request

D. Spatial Land Information

- Geographic Coordinate Data Base
  - Data Request
  - Data Collection
  - Q-Link Processing

VIII. Responsible Parties

Project Manager - J. Kerwyn Keith, BLM NPR Team, (202) 208-4794

Project Review Board - Division Chief (WO-720), all Cadastral Chiefs (12), one-two client/external group members, and John Moeller.

National - Performance Review Coordinator: John Moeller, (202) 208-4794.

IX. Schedule

Events	Deliverable	Proposed Completion Date	Lead
Core Team Training, Reno, Nevada	Trained workgroup team members and finalized Action Plan.	03/07-11/94	J.K. Keith and Core Group
Workgroup Charter and Action Plan	Workgroup Charter and Action of respective concentration area (e.g. Surveys, etc.)	03/30/94	Workgroup Leader
Project Action Plan	Compilation of respective Workgroup Action Plans into total Action Plan.	03/11/94	Workgroups
Milestone: Presentation of project Action Plan to Project Review Board	Approval of Workgroup and overall action plans.	03/30/94	J.K. Keith
Physical Model Construction	Workgroup physical model	04/30/94	Workgroups
Core Team Training, Sacramento, CA.	Peer review of physical models by Core Group. Finalized Physical Models.	05/09-13/94	Core Group
Milestone: Presentation of Phase I Physical Models to Project Review Board	Concurrence of Workgroup Physical Models	June, 1994	J.K. Keith
Logical Model Construction	Workgroup logical models	06/30/94	Core Group
Core Team Training, Denver, CO.	Peer review of Logical Models by Core Group	07/11-15/94	Core Team
Milestone: Presentation and approval of Phase I Logical Models to Project Review Board	Concurrence of Workgroup Logical Models	August, 1994	J.K. Keith
Logical Model Implementation Plans	Implementation plans and identification of support resources of approved logical models for each State Office	08/15/94	Workgroups
Core Team Training, Salt Lake City, UT.	Peer review of Implementation Plan for each State Office.	09/12-16/94	Core Group
Milestone: Presentation and approval of Phase I Logical Model implementation Plans by Project Review Board	Concurrence on implementation plans	September, 1994	J.K. Keith
Supplemental/Supporting Activities Resulting from the Reengineering Project			
Performance Measures	Performance Measures and evaluation methodologies for use in FY96 TPR/GME of reengineering project.	Nov., 94	Workgroups
95 PAWP	Directives for implementation of Phase I plan	August - Sept., 1994	WO-720

Administrative Manual Update	Review interim 9600 "Geosciences" administrative manual and initiate new or revised manual sections to reflect reengineering project.	Mar., 1995	WO-720
73' Manual Rewrite	Review completed manual chapters and modify to reflect reengineering project.	Schedule to be finalized by Ad Hoc Group per 02/94 Chiefs meeting.	WO-720
FY96 TPR/GME	TPR/GME for six states	October -Nov., 1995	WO-720
FY97 TPR/GME	TPR/GME for six states	October Nov., 1996	WO-720

X. Approval

Francis D. Fichtner — April 7, 1994
Chief, Division of Cadastral Survey — Date

Tom Walker — April 11, 1994
AD, Support Services — Date

John J. Mueller — April 12, 1994
NPR Coordinator — Date

Don P. Mason — Apr. 14, 1994
~~Deputy~~ Director, Bureau of Land Management — Date

Introduction

In March of 1994, the Cadastral Survey Program initiated the Cadastral Survey Reengineering Project in response to the National Performance Review (NPR). Because of recent technological advances and rapidly changing customer needs, the Cadastral Survey Program was recognized as providing a unique opportunity to accomplish NPR goals on a national scale. In August of 1994, the project obtained Lab status.

Executive Summary

Reengineering any business is a dynamic and evolutionary process. As we continue application of automated systems in the 21st century, dramatic changes in our basic business events are inevitable. Recent advances in automation and information technologies, increasing levels of intergovernmental cooperation and developing partnerships, continuing technical and legal requirements, as well as fundamental changes in our customer's needs for land surveys, spatial land information, and geographic products and services require that Cadastral Survey expand its role not only as a field going operative, but as a true land and information management body. We cannot and will not forsake our strong history or the lessons of the past. Instead, we will move forward as leader and partner in performing our function as stewards of the Public Land Survey System.

The following findings and recommendations are based on extensive study by the Bureau of Land Management's Cadastral Survey NPR Laboratory. The study included the use of customer and peer group questionnaires, focus group discussion and lengthy discussions within the Core Team, as well as with our peers in government and the private sector. Additional work required the use of business process analysis and smaller self-directed teams comprised of members from the Core Team and selected technical advisors.

Findings and Recommendations Based on Customer Input

Product Quality

Finding: Both internal and external customers indicated an overall satisfaction with the products and services they receive from Cadastral Survey. Quality of the base product (field notes and plats) is highly regarded.

Recommendations: Maintain quality standards through in-house review utilizing automated techniques and a quality assurance program that is accomplished throughout the course of the project.

Timeliness of Product Delivery

Finding: Current baseline for survey approval is 27 months. The general trend among offices is to negotiate a delivery schedule for final products with the customer that reduces this timeframe.

Minimum recommendation: Reduce average product delivery time to 12 months following completion of the field survey. Encourage and provide a mechanism for negotiating timeframes that assures all surveys meet this timeframe and further reduces overall product delivery time.

Maximum Recommendation: Reduce average product delivery time to 90 days following completion of the field survey and provide a mechanism for negotiating timeframes outside of this standard.

Format of Base Product: Field Notes, Plat & Plat Only

Finding: Current format of the official record of cadastral surveys calls for a plat with separate supporting field notes. There are minimum requirements prescribed by law which must be contained in the official survey record. The current format is not a legal requirement, but rather a self-imposed format that results in duplication of information.

Recommendation: Refine the field notes while maintaining minimum requirements of law and eliminate self-imposed requirements that are no longer value added.

Recommendation: Use "plat only" surveys where all field note data can be adequately represented on the face of the plat.

Recommendation: Develop and adopt field note and platting standards to clarify and simplify depiction of the record of survey.

Access to Cadastral Survey Records

Finding: Cadastral survey records are an intrinsic part of a comprehensive land management policy. The availability and ease with which these documents can be obtained is of paramount importance to the management of lands at all governmental levels. Currently, cadastral survey records are produced as an archival paper record through automated computer programs. These paper records are microfilmed and distributed to the appropriate offices.

Recommendation: Short term
Continue to produce archival paper products.

Recommendations: Long term

Develop a standard to authenticate the digital record from which the archival paper product is produced as the official duplicate copy and made available to the customer.

Develop a nationwide standard for indexing digital records for ease of access.

Develop standards for imaging historical cadastral survey records in conjunction with the national indexing system.

Develop distribution of Cadastral Survey records by public access through the Internet, purchase of CD-ROMs, phone modems and access to the Bureau's modernization system.

Streamlining Section Subdivision

Finding: Reimbursable customers are being charged for more survey than they feel is necessary to identify and/or convey selected lands. Product delivery is delayed as well.

Recommendation: Monument only those positions which define the boundaries of Federal interest lands.

Recommendation: Preclude the "running" of unnecessary subdivision-of-section lines.

Integrated Product Review Procedures

Finding: Lack of ownership and the willingness of employees to "let someone else check it" has led to increasing levels of review which ultimately affect cost and timeliness of product delivery.

Recommendation: Following the completed process model for the reimbursable dependent resurvey, begin institution of integrated quality assurance programs for technical and legal survey examination and severely curtail quality control at the end of the production phase.

Findings and Recommendations Based on Peer Group Input

Software Development and Documentation

Finding: Cadastral Survey lacks standardized, well documented survey software.

Recommendation: Standardize software requirements Bureau-wide, including Cadastral Measurement Management (CMM) & GCDB Measurement Management (GMM).

Recommendation: Acquire and/or develop clear and concise software documentation for all required software.

Training Relative to Automation

Finding: Cadastral Survey lacks a concentrated effort to adequately train surveyors in the use of automation technologies and software.

Recommendation: Develop a cadastral survey software training program that provides quality integrated training in CMM, GMM, Cadastral Electronic Field Book (CEFB), AutoCAD, and Global Positioning System technology (GPS).

Recommendation: Develop and publish a list of available automation training.

Team Concept

Finding: Survey staff will need to serve in a multi-tasked environment to better serve the Bureau's survey and land information management role of the future.

Recommendation: Begin immediate institution of team based production philosophies.

Findings and Recommendations Based on Core Team Discussions

Regionalization of Survey Functions

Finding: Fiscal and human resources should be put to use where needed most based on customer requirements.

Recommendation: Maximize efficiencies in the use of land surveying resources through regionalization of management functions.

Manual of Surveying Instructions Rewrite & Development of 9600 Administrative Manual

Finding: The current Manual of Surveying Instructions, 1973 and the 9600 Administrative Manual is in need of revision.

Recommendation: Revise and update the Manual of Surveying Instructions to serve as a repository for technical issues guiding the Cadastral Surveyor in his/her work.

Recommendation: Resurrect and update the 9600 Administrative Manual.

Multi-tasking of Land Surveyors

Finding: Full implementation of the Core Team's proposals regarding team based survey projects, integrated review and base product format will lead to a changing role for the Cadastral surveyor. Off-season work of record preparation and review will be minimized to the point where other duties can and should be assigned.

Recommendation: Field surveyors should be assigned productive work in areas where there are identified needs. Cancellation of the GCDB collection contract has created a great need for increased utilization of in-house staff to perform initial collection and maintenance of GCDB. There is also a need for assistance in the elimination of backlogged surveys stuck in the review stage of the old survey process.

Engineering the Geographic Coordinate Data Base - Operations & Maintenance

The Bureau of Land Management is responsible for managing information, as well as land and resources. Information about land boundaries, records, and resource use is critical to making sound management decisions that will safeguard the long term ecological sustainability, natural diversity and productivity of the land. The Land Information System (LIS) concept is a part of the BLM's total modernization strategy to increase efficiency in managing both land information and resources, to improve accuracy and quality in decision making, and to serve its customers' growing need for spatial land information.

The Geographic Coordinate Data Base (GCDB) is critical to the development of the Bureau's LIS. The GCDB portrays the legal land parcels of the Public Land Survey System (PLSS) and provides the capability to tie legal land parcel information to points on the ground by using latitude and longitude. This data base will comprise the Land and Survey Theme (L&S) on the Bureau's Modernization platform, the foundation theme on which all other data themes can be accurately registered and compiled.

The GCDB is a public data base and a key component of the National Spatial Data Infrastructure (NSDI), in partnership with federal, state, local and tribal governments, academia, private industry and the public. The GCDB will contribute to the creation of a national digital geospatial framework through the National Geospatial Data Clearinghouse as mandated by Executive Order 12906.

The GCDB can be a comprehensive information resource only as a dynamic data base whose positional reliability becomes increasingly accurate over time. Current, high quality data is crucial to support both public and private sector applications of geospatial data. Once initial collection is completed and data conversion performed, the GCDB must be continually updated and maintained to remain a valuable public asset.

The Cadastral Survey Reengineering Lab has determined and designed the future business requirements for the Operations and Maintenance (O&M) of the GCDB. The purpose of O&M is to build and maintain the Bureau's Land and Survey Theme and provide accurate, cost effective spatial information that can be used as a common framework to support land and resource management across government agencies and private industry.

The BLM's commitment to the development and maintenance of spatial land information will become more important in the years ahead. The steady increase of requests for information and competing demands for use of the public lands will present even greater management challenges. As an integral part of an information society, the BLM plays a substantial role in providing access to timely, accurate land information. The BLM can continue to be a recognized leader in managing and providing land information by implementing a fully operational O&M program.

In support of the BLM's vision to efficiently and effectively manage land records and other spatial data, the Core Team presents the following findings and recommendations.

Functions of Operations and Maintenance (O&M)

Finding: The purpose of O&M is to build and maintain the Bureau's Land and Survey Theme as a common PLSS framework that will support land and resource management

across government agencies and private industry. To achieve this purpose, thirteen O&M functions have been identified.

1. Collect land and survey information, build and update the Land and Survey Theme and Control Theme.

2. Build and maintain a Control Theme.

3. Inventory and evaluate data from external sources.

4. Reformat and/or supplement data from external sources.

5. Identify and resolve conflicts between incoming coordinate data and land descriptions.

6. Improve Land and Survey data to meet data standards, fill in missing data, delete duplicated data.

7. Determine schedule for updates and provide notification of updates.

8. Assist with the evaluation of impacts on other data themes from updates to the Land and Survey Theme.

9. Verify, check, and correct updates made to the Land and Survey Theme.

10. Distribute digital data of the PLSS and Control data.

11. Produce cartographic and report products.

12. Establish and execute partnerships for data sharing and exchange.

13. Assume Data Stewardship responsibilities to assure compliance with data standards and quality assurance procedures.

Recommendation: The Bureau should continue to support national efforts in providing and managing spatial information through implementation of an O&M program. The thirteen identified functions should be used as a benchmark in developing future mission, workload and funding strategies.

Partnerships and Cooperative Efforts for Data Exchange

Finding: In order to eliminate duplication and increase efficiency, resulting in cost and time savings, Executive Order 12906 requires the maximizing of cooperative participatory efforts with state, local, and tribal governments, the private sector, and other nonfederal organizations. OMB Revised Circular A-16 requires federal cooperation and identifies possible long-term federal partners.

Recommendation: Utilizing the guidelines that have been issued by the Federal Geographic Data Committee to encourage establishment of data sharing agreements, efforts to build new partnerships with participants both inside and outside the government should be increased. Many state and local governments are developing their own data base with cadastral information. Those entities should be actively pursued and assisted in creating their data bases in a format acceptable to the GCDB.

GCDB Relationships with Cadastral Survey Processes and Products

Finding: GCDB is the spatial representation of the PLSS on the Bureau's LIS. As such, GCDB O&M is but a continuation of the traditional cadastral record production process. The production of the spatial component of the PLSS should be an integral part of the survey process.

Recommendation: A seamless flow of data should be developed to truly complete an automated "field-to-finish" environment for cadastral records. The output from any of the cadastral processes should flow directly into the GCDB collection and update functions in a format acceptable for inclusion in
the spatial database.

GCDB O&M on the Modernization Platform

Finding: An analysis of the present system specifications indicates that the Automated Land and Minerals Record System (ALMRS) may not be sized to accept all the initial collection of GCDB spatial data, much less have the workspace capacity to perform O&M. There are presently no plans to host the O&M software on this system.

Recommendation: Based on the experience from the New Mexico IOC testing, the Systems Engineering Group at DWO should arrange for the sizing of the modernization system to accept all initial collection of GCDB information, host the O&M software, and provide the workspace to perform O&M.

Basic Automated Needs for GCDB O&M

Finding: Executive Order 12906 mandates continued maintenance of geospatial data. The GCDB should be maintained as a dynamic data base, capable of being updated on the Bureau's modernization system. Four basic classes of automatable GCDB O&M functions have been identified.

Recommendation: Logical modeling of these automatable O&M functions has been completed. As O&M for GCDB has never been performed before, these models should be manually tested and validated by a state office GCDB team. After that testing, physical models should be produced and software developed so that O&M can be performed on the modernization platform.

GCDB Baseline Products and Special Product Needs

Finding: Graphic and alphanumeric GCBD products support both public and private sector applications of geospatial data. ALMRS IOC provides the capability to produce some baseline products, however, standard products for specific program needs and special user-defined products are required.

Recommendation: Fast track efforts to deliver GCDB products to customers in the interim before modernization. Assign a technical team to identify and define baseline products that will meet specific program needs and that will provide a minimum base capable of supporting other mapping and special product needs. Develop a GCDB Products and Services Users' Guide.

O&M Relationships and Impacts on Other BLM Record Functions

Finding: The Land and Survey Theme is a dynamic data base whose positional reliability will be improved through the O&M process. Positional shifts will cause dependent data themes to shift, and may require the update of related records. Gross discrepancies may require a survey to correct the official record.

Recommendation: Provide timely notification of O&M updates to all internal and external customers. Establish a team in each BLM State Office that is composed of technical representatives from affected data themes and record functions to identify issues, evaluate impacts and resolve conflicts.

Supplemental Issues

Early in the reengineering process it became evident that the number of issues raised by the Core Team would equal or exceed the tasks prescribed by the charter. A working list of these issues was kept and procedures worked out for resolution of as many issue as possible. Some issues have been successfully resolved, others have been approved in concept by the Project Review Board and others were never pursued by the Core Team. They are all retained on the Issues List for continuity. The following chart gives a brief synopsis of these issues and their current status. Additional discussion and supporting documents can be found in the body of the following report and in the Appendix.

Issue	Laws, Regs. or Policy that apply.	Desired Results	Status	No
Streamlining section subdivision The setting of center 1/4 section corners and one-sixteenth section corner monuments which control or define federal interest lands. "Running" all subdivision of section lines	Manual 6-31 and 7-12 Title 43 USC §752 The act of Feb. 11, 1805 Manual 3-87	Monument only those positions which define the boundaries of Federal interest lands. Preclude the "running" of unnecessary subdivision-of-section lines.	Completed: Approved IM No.95-152 Expires 9/30/96	1,2

Software development and documentation		Standardized and well documented software that is user friendly and incorporates all appropriate user interfaces and requirements.	Ongoing: Requires preparation of concept paper for submission to the Project Review Board (PRB) for approval to proceed.	3
Training relative to automation.		1. Develop a Cadastral software training program that provides quality training in Cadastral Management Measurement, GCDB Measurement Management, Cadastral Electronic Field Book, AutoCAD, and Global Positioning System technology. 2. Make available a list of automation training.	Ongoing: IM forwarded to PRB for approval.	4
19% Administrative Overhead Surcharge Untimely transfer of 9800 funding Inefficient and costly billing practices for reimbursable clients		Suspension/Waiver of Overhead Charges on reimbursable accounts. Reduction in overhead charges. Detailed explanation of overhead charges. Immediate transfer of funds Ability to code directly to agency. Ability at the field level to charge directly to benefiting agency for work provided, i.e. T&A's, travel, vehicles, etc.	Completed: IB awaiting signature. The IB does not present solutions to the issues but does provide guidance and information.	5,7 & 25

Closing against pre-existing surveys		No unnecessary retracement or resurvey of adjacent lines for closure purposes only.	Completed: Approved IM No. 95-154 Expires: 9/30/96	6
Corrections to the record of the Official Survey		The ability to make notation or correction on the face of the plat or notes.	Ongoing: Concept remanded to the Core Team for further study; sent to the Solicitor for legal interpretation	8
Stewardship of PLSS records.		Maintain the Public Land Survey System records in an automated environment.	Deleted: After further contemplation, the Core Team determined this to be a statement and not an NPR issue. No further action to be taken.	9
Corrective resurveys on private land where a previous BLM Survey missed original evidence, or made a blunder and thus infringed on the bona fide rights of the landowners.		Clarification of responsibility to make corrections to approved surveys.	Deleted: The Core Team determined that BLM has no authority to conduct surveys on private land. No further action to be taken.	10
Digital records		All states produce the final records in digital format.	Ongoing: Requires preparation of a concept paper for submission to the PRB for approval to proceed.	11

Technical services contracts		The ability to utilize technical services contracts in performing cadastral surveys when appropriate.	Deleted: Concept not approved by the PRB.	12
FTE restrictions		Remove restriction on FTE if funding is available.	Deleted: The NPR advised all Labs to avoid addressing the FTE issue. No further action to be taken.	13
The use of coordinates in surveying		Coordinates become part of the evidence of the corner.	Ongoing: Requires preparation of a concept paper for submission to the PRB for approval to proceed.	14
Ties to Federally Owned Interstate Highway Rights-of-Way	IM 75-178(Dated April 15, 1975)	Tie to right-of-way as topographic feature only, unless requesting agency requires lotting for management purposes.	Completed: Approved IM No. 95-151 Expires: 9/30/96	15
Closing corners.	Manual Sec. 5-35 and 5-41	Give CC's equal value as other corners on same line once a careful retracement of the line has been made.	Deleted: This was determined to be inconsistent with court decisions and prudent survey practice. No further action to be taken.	16

Timeliness of hiring temporary employees		Hire in a more efficient and timely manner.	Deleted: This was determined to be an OPM issue. No further action to be taken.	18
Regionalization of survey functions.		Maximize efficiencies in the use of land surveying resources through regionalization of management functions.	Completed: Passed to the ICCC Executive Committee Concept Team.	19
Limited authority for contracting.		Increase warrant authority to the State Offices for contracting.	Deleted: Warrant authority doubled by IM WO 95-165. No further action to be taken.	20
Procurement policies. 1. Credit cards limits and authority. 2. GSA contract items. 3. Telephone purchasing authority		Have the necessary dollar limits and authority at the operational level to make purchases at competitive costs.	Deleted: This issue has been addressed; purchasing authority has been increased with the use of credit cards. No further action to be taken.	21
Plat filed with or without public notification. Current policy is use of Federal Register notice		Clarify the needs and requirements for public notice and determine the appropriate means in which to accomplish this	Deleted: Concept not approved by the PRB.	22

Cost recovery for data maintenance and stewardship of information.		Establish appropriate fees for data retrieval in order to create funding to upgrade data base as technology changes.	Deleted: Concept not approved by the PRB.	23
Bearing trees & other cadastral survey corner accessories		1. Do not give the full compliment of scribe marks on BT's 2. Affix nail and metal washer embossed with "BLM" at the base of tree or scribe the tree "BT" at base 3. Use DEEP-1 magnetic locators in lieu of natural accessories as prescribed by the Manual 4. Eliminate accessories, and when necessary to reestablish the position, measure from nearest controlling corners.	Deleted: Determined to be imprudent survey practice. No further action to be taken.	24
Administrative automation		Under Development	Ongoing: Requires preparation of a concept paper for submission to PRB for approval to proceed.	26
Manual of Surveying Instructions rewrite & development of 9600 Administrative Manual		1. Produce an up to date Manual of Surveying Instructions 2. Resurrect & update 9600 Admin. Manual	Ongoing: Elevated to a major finding.	27 & 30

5% rule		Show true acreage for all federal interest aliquot parts on the plats of dependent resurveys. Follow the present rule and only change the legal description of an aliquot part when the acreage change exceeds 5%.	Deleted: Concept not approved by the PRB.	28
Determine mechanism with which to recoup equipment costs on reimbursable surveys.		Undeveloped	Deleted: Deleted after further contemplation by the Core Team. No further action to be taken.	29
45 chain rule.		Eliminate the requirement to establish monumentation at 45 chain minimums.	Deleted: Concept not approved by the PRB.	31
Wyoming records imaging		Have Wyoming historical field notes and plats scanned to digital format instead of placed on microfiche.	Ongoing: Requires preparation of a concept paper for submission to PRB for approval to proceed.	32
Reposition/relocate original mineral surveys in relation to the Public Land Survey System.		Develop a mechanism for updating the public record when additional information becomes available.	Tabled: To be reviewed at a later date. Concept approved by the PRB for additional research.	33

Legal description in independent resurveys		Provide a mechanism to retain legal description of patented lands when performing an independent resurvey.	Deleted: The Core Team failed to reach concensus on this issue. No further action taken.	34
NAD 27 vs NAD 83		Adopt NAD 83 as the datum for all cadastral surveys.	Ongoing: Concept approved by the PRB for additional research.	35
Definition of new base product.		Based on customer needs, a detailed examination of current products useability, format, and content should be initiated with follow-up recommendations for a new base product which meets the minimum legal requirements and eliminates self-imposed requirements which are not value added.	Ongoing: Core Team decided that this would be submitted in final report as a recommendation.	36
Redefinition of "limits of closure"		Use of error ellipses and positional tolerances in determining the limits of closure.	Dormant: Concept is tabled until the rewrite of the Manual of Surveying Instructions.	37
Use of private survey data (records)		The ability to use acceptable private survey records in the preparation of supplemental plats and other uses where appropriate.	Ongoing: Forwarded to the solicitor for legal interpretation.	38

Accomplishments, Barriers and Lessons Learned

The Core Team has been together since March of 1994. This diverse group of individuals have coalesced into a goal oriented "family" unit capable of producing a wealth of innovative ideas while suffering the emotional highs and lows associated with such an immense undertaking. We have accomplished much, surmounted a variety of barriers and learned many important lessons to be shared with others faced with similar challenges.

Accomplishments to Date

- A completed National external customer survey.
- A completed organization-wide employee survey to determine barriers in current operation and suggestions for process improvement.
- A system for barrier issues identification and a review system established with programmatic leadership.
- Instituted video conferencing with the Deputy Director.
- Completed logical model construction on six major business events (GCDB, Original Survey, Dependent Resurvey, Reimbursable Survey, Contracting, Supplemental Plats).
- Increased dialog on alternative service delivery systems within the Cadastral Survey Community.
- Publication of newletters to deliver information to internal and external customers.
- Increased levels of interagency communication and cooperation between land surveyors.
- New policies, by way of Instruction Memorandums, have been implemented as the result of the reengineering process.
- Provided skilled quality and reengineering coaches and specialists in the BLM field offices.
- Successfully developed a high performing, self-directed team.
- Recognition as one of five BLM NPR Reengineering Labs.

- Increased programmatic visibility of Cadastral Survey.

- Reengineered Cadastral Survey Business Events identified by Cadastral Management.

Barriers Encountered

The principle barrier the Core Team encountered was that reengineering was only a part time job. Full-time continuous participation by all the Core Team members would have been the best alternative. The intermittent meetings and long periods of relegation to other duties between meetings resulted in a slow down in progress by the Core Team.

As is true with most start-up teams, there was uneven participation by the team members. Several participants significantly invested in the project and outcomes, while other team members were non-participatory or minimally involved.

Lessons Learned

The initial lesson learned from this experience is that more "up front" work needed to be done to define the parameters of the Lab. A focus group should have been formed to discuss alternatives and to develop customer questionnaires prior to formation of the Core Team. Our team was constrained by the untimeliness of obtaining results from our questionnaires. We also feel that our questionnaire development might have been influenced by our own preconceived notions of what we may or may not learn from our customers. Did we ask the right questions or were we merely looking for approval of our own ideas?

A clear validation process between the Project Review Board and the Core Team should have been negotiated earlier in the reengineering effort. This should have included short term and long term expectations as well. The lack of direction in this critical element led to some misunderstanding between the two entities.

Input from other agencies affected by potential changes brought through reengineering was critical to success. More focused effort to maintain participation of these individuals on both the Project Review Board and on the Core Team would have promoted more ownership in our efforts on behalf of the participating agencies.

Geographically dispersed teams are not as productive as co-located teams. The team chosen had representatives from each State Office. Customer representatives on the team were also from diverse geographic locales. Instead of co-locating the team until the reengineering design was completed, periodic meetings were held to help facilitate the collaboration and teaming necessary to create the models and designs. The lack of continuous co-location

delayed the final product and also created additional team frustration.

Leadership that is active and willing to preempt resistance to change that will invariably surface during the reengineering process is critical. During the middle of the reengineering effort the Division Chief and chief advocate for the reengineering effort retired. The leadership void was never adequately filled and the effort lost, at least perceptually, some key followers and enthusiasm.

Commitment to time and travel cost to assemble a geographically dispersed team is critical. The decision was made to have the Cadastral Reengineering Team meet periodically to work on and finalize the teams designs and model. The team by and large was able to meet, but not as often as required, thus creating frustration and precipitous decline in enthusiasm by the team in accomplishing their tasks.

Human factors are the biggest barrier to successful reengineering. Reengineering requires not only the changing of the technical layer of the organization, but also the infrastructure and value layer. Examination of the infrastructure layer must include the reward structure, management systems, and management methods. The study of value systems within the organization must focus on organizational culture, political power, and individual belief systems. Success in reengineering must include all of these parts; only the technical layer was being dealt with by the Reengineering Team during the study period. The Core Team has attempted to address the human factors in the implementation phase, however.

External events continuously reshaped the frame of action. In the course of the 18 months that the Lab has been operating, the second round of the National Performance Review (REGOII) and mid-term elections reshaped the landscape for reengineering. The venue switched from no sense of emergency to acute crisis as the Cadastral Survey program was on several lists for privatization under REGO II and slated for severe budgetary cutbacks. The external pressure heightened the need for the reengineeing team to finalize and sometimes shift focus of the team efforts. Conversely, some in the Cadastral Survey organization viewed the reengineering effort as the source of perceived programmatic decline and budget cut targeting.

Reengineering designs must be done quickly and not protracted over a long period. The long nature of 18 months from the start of the reengineering project to implementation was too long. As previously stated, several external events preempted the reengineering team's efforts and focus that not only delayed completion, but resulted in increasing resistance to acceptance of the designs and models.

Pilot Projects Within the NPR Lab Framework

Pilot projects are a function of NPR-Reengineering Cadastral Survey. They serve as "real world" testing vehicles for ideas and concepts developed through the reengineering process. This NPR Lab is currently conducting several pilot projects to test the performance and usability of doing business in a more efficient manner. These pilot projects are long term and ongoing with final results being assessed upon completion. For the most part, these pilot projects were intended to be in place for one year. This will assure that the entire cadastral process, both field and office functions, will be properly evaluated. Upon completion, a formal report of the projects will be assembled and distributed through normal channels. It is anticipated that the reports will be completed around January or February of 1996.

The Final Report details five important pilot projects that demonstrate successful implementation of several of the major Findings and Recommendations presented by the Core Team.

Implementation Goals and Strategic Plan

The chart on the following page is an abstract of the implementation strategy developed by the Core Team. Please refer to pages 128-135 of the Final Report for a complete discussion.

Implementation Matrix Based on Implementation Goals and Strategic Plan

Recommendation	Action	Timeframe
Team based survey execution	Present an implementation plan to all respective State Directors	March 1, 1996
Format of the base product	Produce all future survey products in the format outlined previously in this document	April 1, 1996
Software development and documentation	Produce upgraded and standardized versions of cadastral survey software complete with documentation.	Identify team by January 1, 1996 Complete project by January 1, 1997
Training relative to automation	Assign training coordination duties to the Software Development Team (see above).	Commensurate with development of new technology (see above)
GCDB O&M	Handoff and establish recommended GCDB O&M functions.	ASAP & as IOC is developed and implemented
Pursue CD-ROM storage and retrieval capability for official cadastral survey records. Wyoming State Office should be considered for a pilot project.	Forward a request for assistance to the BLM Electronic Imaging Workgroup.	December 1, 1995
Manual of Surveying Instructions rewrite and production of the 9600 Administrative Manual	A strategic plan and implementation schedule to be developed by the PRB Rewrite of the 9600 Manual Submit for review/approval	January 1, 1997 Begin January 1, 1996 Complete July 1, 1996
The future of the NPR effort	Project Review Board should consider this issue and make recommendations.	February 1, 1996

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Introduction

The Bureau of Land Management's Cadastral Survey program has legislative authority for the survey of public lands and stewardship of all Public Land Survey System (PLSS) survey records. We have acted in this capacity in one form or another under various political entities since the passage of the Land Ordinance of 1785. We serve all Federal agencies with public land management responsibilities. The advent of the National Performance Review and the selection of Cadastral Survey as an active participant in the program has allowed us to reexamine how we serve our internal and external customers.

Initial Objectives

- Establish measuring mechanisms for project success.
- Improve overall survey delivery by decreasing the maximum time period from the survey completion date to approval within 90 days, by the end of FY-96.
- Integrate automated techniques and processes in the Cadastral process by the end of FY-96.
- Identify opportunities for marketing products and services to clients.
- Identify existing statutes, laws, regulations, and policies that will constrain the reengineering process.
- Identify resources and processes to eliminate the backlog of existing survey returns by the end of FY-97.
- Produce a Bureau-wide analysis model and design partitioning for Cadastral Survey.
- Produce implementation action plans and schedules of reengineered Cadastral Survey process Bureau-wide.

Background

The process of evaluating our business practices has been a valuable experience. We have focused on customer requirements, business practice reengineering, issue determination and resolution and implementation of solutions. We have succeeded in refocusing National attention on this valuable program while including feedback from our customer base to provide a quality product with fewer roadblocks and in a format and timeframe acceptable to

our customers.

Business Process Analysis

Applied Structured Analysis was employed as a tool to show current processes for designated business events, and to identify those portions that are not value added. Those portions that add unnecessary costs or delay in delivery times to the survey were examined and reengineered to be more efficient or eliminated. The end product is a streamlined process for producing a quality product for the customer.

Applied Structural Analysis is a four part developmental process whereby a business practice is dissected based on the current physical model, the current logical model, the future logical model and one or more future physical models. In other words, how do we do things today, what do we do today, what should we do tomorrow and how will we accomplish these tasks tomorrow.

A more detailed analysis of this process is discussed in the appendix under Reimbursable Dependent Resurvey.

Customer Requirements

During 1994 and 1995, the Cadastral Survey Reengineering Team sponsored several customer surveys to assist with the reengineering of Cadastral Survey processes as required by Executive Order 12862. Executive Order 12862 dictated that a three step survey process be adopted to determine customer service standards. Those requirements were: (1) Customers be surveyed to determine "the kind and quality of services that they want." (2) Customers be surveyed to determine "their level of satisfaction with existing services." (3) Survey "front-line employees on barriers to, and ideas for, matching the best in business." To meet these requirements the team adopted the following methods: the use of a focus group, the development and nationwide distribution of a comprehensive customer satisfaction questionnaire, and the use of a peer group questionnaire.

The focus group consisted of knowledgeable employees from other agencies which employ cadastral survey products in their land management practices. Participants in the focus group came from the National Park Service, U. S. Forest Service, Bureau of Indian Affairs and the Bureau of Land Management. Five open ended questions were supplied in order to guide the discussion. The discussion was recorded to facilitate an analysis of the meeting.

Initially a pilot customer satisfaction questionnaire was designed by the team. This sample

questionnaire was distributed to a cross section of over 100 identified customers across the nation to determine the suitability of the questions. After the sample results were received the questionnaire was modified by the team and a mailing list of customers developed. The final questionnaire was divided into two principal categories: one dealing with traditional cadastral survey products and services; the second geared towards spatial land information consisting of the Geographic Coordinate Data Base (GCDB) and geodetic products and services. The Social and Economic Sciences Research Center at Washington State University, Pullman Washington was contracted for data input and processing. Approximately 1750 questionnaires were distributed nationwide. The response rate from this sampling was just over 25%. Federal agency employees comprised 48% of the sample, of these, BLM responses accounted for the largest sector at 58%, followed by the U.S.F.S. at 24% and the BIA at 6%. Eight other agencies were represented in the results. State, county, municipal and tribal governments made up 20% of the respondents. Private sector individuals accounted for 32% of the data. The largest occupation represented in the responses was that of Land Surveyor at 43% of the total. Realty Specialists were second with 8% of the total.

The external customers indicated an overall satisfaction with the products and services they receive from the BLM. The service most requested is that of general survey information (49.7%), followed by general advice (46.3%), remonumentation of and marking and posting of boundaries, respectively (43.5% and 35.8%). Requests for GCDB information are rapidly increasing in all offices.

In July of 1994 a questionnaire was distributed to approximately 300 employees within Cadastral Survey to gather input and evaluate opinions concerning potential time and cost savings. The data from this survey was gathered and processed by the Colorado State Office of the BLM. 185 employees took the time to reply for a response rate of approximately 62%.

Findings and Recommendations Based on Customer Input

Product Quality

Finding: Both internal and external customers indicated an overall satisfaction with the products and services they receive from Cadastral Survey. Quality of the base product (field notes and plats) is highly regarded.

Recommendations: Maintain quality standards through in-house review utilizing automated techniques and a quality assurance program that is accomplished throughout the course of the project.

Discussion: A majority of customers responding indicated satisfaction with the overall quality of Cadastral Survey products and services.

Timeliness of Product Delivery

Finding: Current baseline for survey approval is 27 months. The general trend among offices is to negotiate a delivery schedule for final products with the customer that reduces this timeframe.

Minimum recommendation: Reduce average product delivery time to 12 months following completion of the field survey. Encourage and provide a mechanism for negotiating timeframes that assures all surveys meet this timeframe and further reduces the overall product delivery time.

Maximum Recommendation: Reduce average product delivery time to 90 days following completion of the field survey and provide a mechanism for negotiating timeframes outside of this standard.

Discussion: Less than half of external customers responding indicated satisfaction with the timeliness of product delivery. A majority of customers were receiving the final product within 24 months. Fully a third of the customers responding indicated they received the final product in 12 months or less following completion of the field survey operation.

Internal input relevant to reducing overall timeframes included:

- increase use of automation, including existing software such as CMM and CEFB;
- getting more complete information from the customers at the beginning of the process; and
- reducing "in-basket" time between steps in the process.

Format of Base Product: Field Notes, Plat & Plat Only

Finding: Current format of the official record of cadastral surveys calls for a plat with separate supporting field notes. There are minimum requirements prescribed by law which must be contained in the official survey record. The current format is not a legal requirement, but rather a self-imposed format that results in duplication of

information.

Recommendation: Refine the field notes while maintaining minimum requirements of law and eliminate self-imposed requirements that are no longer value added.

Recommendation: Use "plat only" surveys where all field note data can be adequately represented on the face of the plat.

Recommendation: Develop and adopt field note and platting standards to clarify and simplify depiction of the record of survey.

Discussion and details of recommendations: The information contained in the field notes and on the plat (corner descriptions, corner accessories, acceptance/rejection statements, evidence evaluation, restoration methods, etc.) is prescribed by law. The current format is self-imposed, duplicative in many instances and requires a complexity valued only by the Cadastral Survey community.

The following information is the Cadastral Reengineering Core Team's recommendations for the redefinition of our base product(s). These recommendations reflect the results of our 1994 Customer Questionnaire, Focus Group Interview, Peer Group Questionnaire and months of discussion. Examples of most of these recommendations can be found in current Cadastral business practices and are hereby attached in the Appendix.

Field Notes: The following is a list of the <u>minimum</u> information to be contained in the field note document.

Cover Sheet

Index

The index diagram will indicate the page numbers where the corner description can be found. Deviations to the order of writing field notes are allowable and encouraged to satisfy customer requirements (i.e., 1) Corps of Engineers reservoir boundary will be written sequentially with other rectangular corners to follow, 2) Customers (USFS, NPS, etc.) stair step rectangular boundary corners described sequentially with other survey corners to follow).

Page Headers

Township, Range, Meridian, State. Subtitles are optional.

History
History shown in current field note format should be maintained and private surveys that are pertinent to the survey shall be included.

Preliminary Statements

Corner Description
Complete description of the corner. This will include: corner accessories, acceptance/rejection statement, evidence evaluation, restoration method and all other relevant information. A line will separate corner descriptions

Field Assistants

Certificate of Surveyor

Topography
Topography will be reported from the corner if it is used as supporting evidence to validate the corner found or if used as control to reestablish the corner position.

The following information will no longer be part of the minimum field note record.
Bearings and distances along surveyed lines
Magnetic declination
Topography along surveyed lines
General description

Plat: The following is a list of the minimum information to be represented on the plat.

Title

Bearings: Degrees, Minutes, Seconds (*)

Distances: Feet (*)

Area: Acres (0.00 as presently depicted)

Lotting

North Arrow, without declination

Scale

Geographic Position (Latitude/Longitude)
Given at the actual corner tied. Scaled GPs are not allowed.

Standard Monument Description
Example: Unless otherwise stated in the field notes, the standard monument used is a stainless steel post, 28 ins. long, 2 1/2 ins. diam., with brass cap. A magnetic marker is deposited at the base.

Corner Symbols:
These symbols will be consistent nationwide, as to not cause confusion for our customers.

△ Control Station

◊ Original Corner

◆ Original Corner Remonumented

□ State Authority/Other Corner Accepted

■ State Authority/Other Corner Remonumented

○ Proportioned Point Monumented

No symbol: Point Not Monumented

Plat Memorandum Modification
Original Statement: The history of surveys is contained in the field notes.

New Statement: The corner descriptions and other relevant information is contained in the field notes.

Acceptance Statement Modification
Original Statement: This plat is strictly conformable to the approved field notes, and the survey, having been correctly executed in accordance with the requirements of law and the regulations of this Bureau, is hereby accepted.

New Statement: This survey, having been correctly executed in accordance with the requirements of law and the regulations of this Bureau, is hereby accepted.

Information depicted on the plat shall be oriented with North parallel to either border as to best utilize space and minimize the number of sheets.

(*) Our customers overwhelmingly request that we produce our products in degrees, minutes and seconds format with distances reported in hundredths of a foot. The following statement has been used in the Oregon State Office to demonstrate how measurements were made and what information is being depicted on the plat.

The directions of the lines are based on the true meridian as determined by direct solar observations and were carried forward by means of sustained angulation. An analysis of the unadjusted field data assured a closure not exceeding 1:4000 in error. Measured distances and directions have been adjusted by Cadastral Measurement Management (CMM), a computer software that incorporates a least squares adjustment routine. The adjusted bearings and distances are reported to the nearest second and 0.001 chain. [960(942), June 11, 1993]

Plat Only Surveys: Plat only surveys will be allowable provided that all information that would have been included in the field notes is represented on the plat.

Acceptance Statement Modification

Original Statement: This plat is strictly conformable to the approved field notes, and the survey, having been correctly executed in accordance with the requirements of law and the regulations of this Bureau, is hereby accepted.

New Statement: The survey represented by this plat, having been correctly executed in accordance with the requirements of law and the regulations of this Bureau, is hereby accepted.

Items of Further Discussion Concerning the Base Product

Further discussion may be needed as to the relevancy of the Geographic Position (GP) being placed on the plat. Our ability to develop GPs and the advent of the GCDB may have made it unnecessary to show this information on our plats.

An investigation should be made into the feasibility of converting to an industry standard sheet size for all cadastral survey plat products. This investigation should take into consideration changing media to a mylar product and archival storage requirements. The

advantages of moving to an industry standard size (22x34 or 24x36 inches) include the available media precut to these sizes and a larger workspace at our current standard scales. A change of media should be accompanied by a longevity study through the National Archives.

Another minimum base product will be added to this list, in the form of a digital product that will be forwarded to GCDB at the completion of the field survey. A CMM to GMM interface should be developed and should define this additional requirement. Refer to the "GCDB Relationships with Cadastral Survey Processes and Products" section of this report.

Summary: These recommendations have been made based on above mentioned documents, after consultation with the Solicitor's office on legal requirements and with the objective of eliminating duplication of information in the field notes and on the plat. Adoption of these minimum standards will result in time and cost savings without lessening the quality and defensibility of the survey.

Attachments: (Refer to the Appendix)

CA - Corner description notes and plat
ESO - Corner recordation notes and plat
CO - Subdivision of section notes and plat
CO - Plat only
AK - Plat only

Access to Cadastral Survey Records

Finding: Cadastral survey records are an intrinsic part of a comprehensive land management policy. The availability and ease with which these documents can be obtained is of paramount importance to the management of lands at all governmental levels. Currently cadastral survey records are produced as an archival paper record through automated computer programs. These paper records are microfilmed and distributed to the appropriate offices.

Recommendation: Short term
Continue to produce archival paper products.

Recommendations: Long term

Develop a standard to authenticate the digital record from which the archival paper product is produced as the official duplicate copy and made available to the customer.

Develop a nationwide standard for indexing digital records for ease of access.

Develop standards for imaging historical cadastral survey records in conjunction with the national indexing system.

Develop distribution of Cadastral Survey records by public access through the Internet, purchase of CD-ROMs, phone modems and access to the Bureau's modernization system.

Streamlining Section Subdivision

Finding: Reimbursable customers are being charged for more survey than they feel is necessary to identify and/or convey selected lands. Product delivery is delayed as well.

Recommendation: Monument only those positions which define the boundaries of Federal interest lands.

Recommendation: Preclude the "running" of unnecessary subdivision-of-section lines.

Discussion: The following is a quick overview of one California State Office Pilot Project for Gp. 1176, CA, its current status, and a proposal for relief from Manual of Surveying Instructions, 1973 requirements under the guidelines of Cadastral's NPR LAB status. This request was submitted by Dale E. Nelson, Alturas Field Station, October 24, 1994.

California State Office Pilot Project:
Streamlining Section Subdivision

Background

In May, 1993, the Modoc National Forest requested that BLM conduct a dependent resurvey of a portion of Township 39 North, Range 11 East, Mount Diablo Meridian. This request included the subdivision of 14 sections for the purpose of upcoming timber sales.

On June 18, 1993, BLM issued Special Instructions for Gp. 1176, CA, providing for the dependent resurvey of a portion of the exterior boundaries, a portion of the subdivisional lines, and the subdivision of certain sections, Township 39 North, Range 11 East, MDM. (Please refer to attached diagram).

After completing prior Forest Service commitments, the Alturas Field Station began work on Gr. 1176 on June 7, 1994. To date we have retraced 25 miles of control. I estimate that we should have retraced an additional 4 miles of control before the winter snows drive us out.

Proposal

I am requesting relief from Manual requirements regarding the subdivision of sections and the monumentation of controlling minor subdivisional corners. If granted this relief, I propose to subdivide the sections using the following procedure. (Please refer to attached diagram).

1) Control the sections using established methods, monumenting all section corners and 1/4 section corners. I would only monument those minor subdivisional corners that form a corner of Federal interest lands.

2) With the aid of CMM, I would protract the position of all subdivision-of-section corners that control Federal interest lands within each section.

3) I propose to only survey those subdivision-of-section lines which form a boundary of Federal interest lands and to monument only the subdivision-of-section corners that form a corner of said lands.

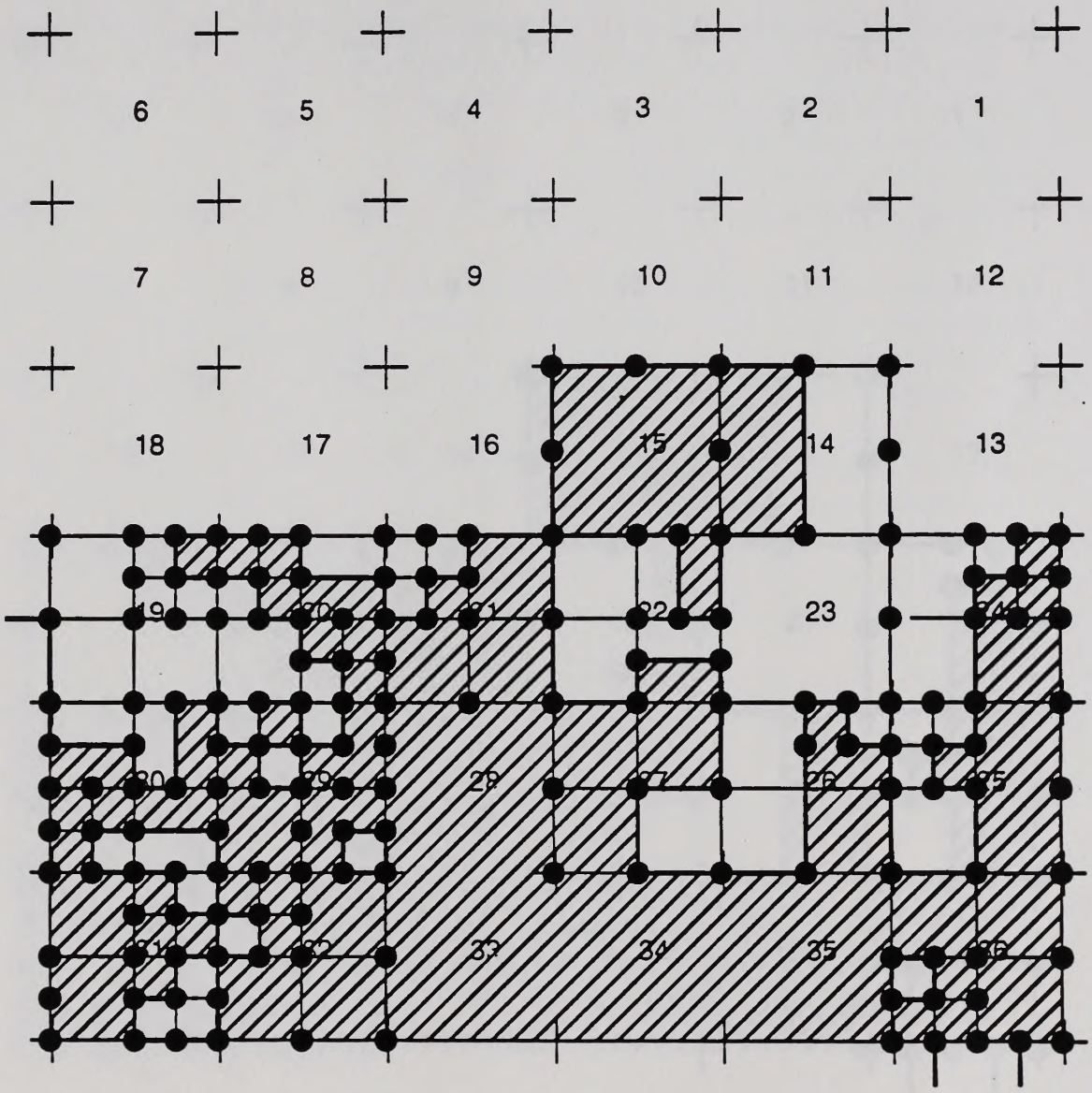
Summary

Under this proposal BLM would eliminate the need to survey 25 miles of subdivision-of-section lines and the monumentation of 31 corner positions. This would result in a cost saving of approximately $24,000; but more importantly, it would reduce the field time by 4 months.

Timeliness of our product has been one of major concern for BLM when it comes to servicing the needs of our external customers. What with ecosystem management and biodiversity, the programs of our external customers are in a constant state of flux, requiring that BLM become more responsive. Reevaluation of traditional Manual requirements is but one way for BLM to meet the challenge and retain its competitiveness.

T 39 N, R 11 E, MDM
Group No, 1176
Knox Mountain

Project as per Special Instructions
Dated June 18, 1993

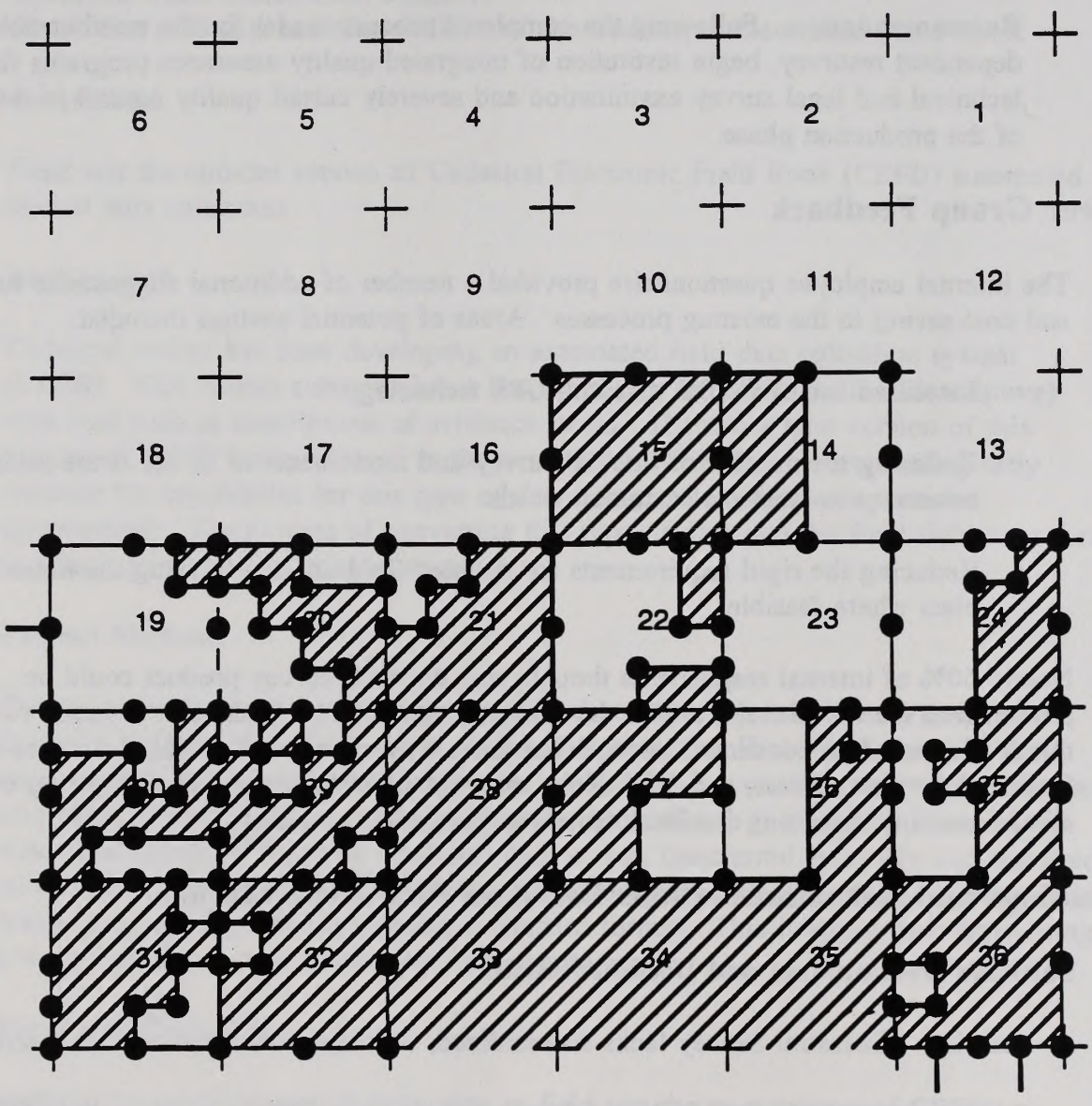


Control	44.0 miles	Corners	166 mons.
Subdivision	45.0 miles	Federal Interest Lands	
Marked & Posted	33.0 miles		

Intentionally left blank.

T 39 N, R 11 E, MDM
Group No, 1176
Knox Mountain

Project as proposed under Pilot Plan



Control	44.0 miles	Corners	135 mons.
Subdivision	20.0 miles	Federal Interest Lands	
Marked & Posted	33.0 miles		

Integrated Product Review Procedures

Finding: Lack of ownership and the willingness of employees to "let someone else check it" has led to increasing levels of review which ultimately affect cost and timeliness of product delivery.

Recommendation: Following the completed process model for the reimbursable dependent resurvey, begin institution of integrated quality assurance programs for technical and legal survey examination and severely curtail quality control at the end of the production phase.

Peer Group Feedback

The internal employee questionnaire provided a number of additional suggestions for time and cost saving in the existing processes. Areas of potential savings included:

- Increased use of GCDB data and GPS technology.
- Reducing the number of lines to survey and monuments to be set at the minimum necessary to meet the customers needs.
- Reducing the rigid requirements for detailed field notes or placing the notes on the plats where feasible.

Nearly 60% of internal respondents thought that the final survey product could be produced at the field level and that the surveyors should certify the plat. Nearly two-thirds of internal respondents indicated that there was room for significant changes in the Cadastral Survey process, and 87% of the respondents indicated the reengineering team should continue soliciting feedback from the Cadastral community.

Findings and Recommendations Based on Peer Group Input

Software Development and Documentation

Finding: Cadastral Survey lacks standardized, well documented survey software.

Recommendation: Standardize software requirements Bureau-wide, including CMM & GMM.

Recommendation: Acquire and/or develop clear and concise software documentation for all required software.

Discussion: The following Pilot Project is one way Cadastral Surveyors are attempting to help implement this finding and its accompanying recommendations.

Montana State Office Pilot Project:
Field Test of Enhanced Capabilities of the Cadastral Electronic Field Book

Description

Field test the updated version of Cadastral Electronic Field Book (CEFB) automated textual data collection.

Background

Cadastral survey has been developing an automated field data collection system (CEFB). This system currently has a limited ability to collect textual (descriptive) type data such as descriptions of evidence found. There is a new version of this portion of CEFB being released in the near future. This new version will greatly enhance the capabilities for this type of data being collected in an automated environment. The process of converting this type of data into the final field note form is a large part of completing a survey.

Present Methods

The most widely used method throughout Cadastral Survey is to record descriptive data in a field tablet. CEFB is not used in this state to collect this data type. The reasons most commonly stated are limited capabilities, no suitable way to port the data into Word Perfect software, and it takes more time than to just write it in a book. After completion of the field work this data is then transferred manually into the field note format. This current method uses word processing (Word Perfect) techniques and macro language to assist in creating a standard format. This is still a time consuming process which can be enhanced by further automation.

Proposed Alternative

Montana Cadastral Survey is proposing to field test the new version of CEFB's enhanced descriptive data collection capabilities. We will field test its full capabilities, determine if it fits into our current system and produce final field notes. This pilot project will involve one survey crew only. If it proves worthy it will then be

incorporated by all of our field crews. We will work closely with Jerry Wahl, Cadastral Automation Coordinator, and the University of Maine to suggest modifications to further enhance its capabilities.

Benefits

We would anticipate a 60 to 70 percent reduction in the time it now takes to create a final set of field notes once the system is fully functional. This amount of time savings will go a long way in Cadastral Survey meeting the anticipated 90 day turn around on survey completion.

Training Relative to Automation

Finding: Cadastral Survey lacks a concentrated effort to adequately train surveyors in the use of automation technologies and software.

Recommendation: Develop a cadastral survey software training program that provides quality training in CMM, GMM, Cadastral Electronic Field Book (CEFB), AutoCAD, and Global Positioning System technology (GPS).

Recommendation: Develop and publish a list of available automation training.

Discussion: Refer to the Appendix for a complete discussion of this issue.

Team Concept

Finding: Survey staff will need to serve in a multi-tasked environment to better serve the Bureau's survey and land information management role of the future.

Recommendation: Begin immediate institution of team based production philosophies.

Discussion: The following Pilot Project demonstrates that team concepts are working within Cadastral Survey. The work accomplished by the California State Office can be used as a model for other offices.

The Oregon State Office is also successfully operating under team principles. Their

Team Concept Guidelines were implemented on February 3, 1992. A complete report on their process and their Operational Plan (April 22, 1994) can be found in the Appendix.

California State Office Pilot Project:
Teams and Cadastral Surveying

Introduction

The original NPR pilot project set up by California will not be completed in time for inclusion in this final report. California started two pilots, as part of their reengineering effort, before the national reengineering pilot project was developed. They were set up to use the team concept to survey and produce a final product without the review process. They did not test new procedures or policies affecting the field work as in the NPR pilot. Both teams were made up a field unit chief, examiner and field surveyor. Others were brought in as needed, but all decisions were made by the three team members mentioned. All the team members attended team building training before the start of the projects. Also, Skip Robinson, Chief, Branch of Cadastral Survey, California, gave the teams the authority to complete the projects without a traditional examination and they would be considered top priority projects.

Note: Team members for the other pilot project, were unavailable, and they are unable to contribute to this report.

Project Descriptions: Campo and La Posta Indian Reservation

This pilot was a project for the Bureau of Indian Affairs (BIA) to identify the Bureau of Land Management transfer lands for the Campo and La Posta Indian Reservations, located east of San Diego, California. These transfer lands are in sections 6, 17, 35 and 36, T. 17 S.,
R. 6 E., San Bernardino Meridian, California. The Campo Band also requested that part of their boundary be posted in sections 13 and 14. This was a dependent resurvey of a 1920's brass cap independent resurvey, and would be considered a technically easy survey. This benefitted the team, because they could concentrate on learning to work as a team instead of trying to work through difficult survey issues. Responsibilities of the team included preparing an estimate for the BIA, writing special instructions, surveying, tracking the budget, making all survey decisions, and preparing final documents for approval.

The first team meeting was held in Sacramento, May 5, 1994, to lay down the ground rules for team operations and to get the project started. A diary of the team

meetings/conference calls would be made, and each member would take a turn at recording the minutes of each meeting. The diary would not become part of the group file, but any decisions made, which were out of the ordinary, would be separately documented and included in the group file. One reason for recording minutes was to make sure that assigned tasks were clear, and when a task was complete the records would ensure that a task wasn't repeated. It would also compel team members to complete their tasks. During team training it was emphasized that teams need to meet regularly. Distances between our team members prevented meeting together in one location. To solve this problem we decided to meet once a week by teleconference.

One lesson learned from the team training is that when the team concept is functioning at full performance each team member can do any other team members duties. This takes time to start, and with the first team trial we believed that we needed to learn to function as a team first before switching duties. Therefore, each team member was assigned duties comparable to their present duties. We planned to switch duties on the next project. John Zink, Examiner, was in charge of quality assurance, writing special instructions, and because of his location in Sacramento he would also take care of any duties done at the State Office. John also sent the completed and accepted corner record sheets to Diane, Editorial Assistant. Diane was brought into the team, on an as needed basis to assemble the field notes. Bob Fink, Field surveyor, would be responsible for the field work, collecting local records and sending completed corner record sheets to John for examination. I was chosen as team leader, and my duties included tracking the budget, keeping the documentation together in one place, and producing the plat.

The team as a whole functioned well, but the idea is not without its problems. The biggest drawback was the physical distance between the team members. We tried to overcome this problem by using electronic mail and teleconferencing, but grasping survey problems over the phone is very difficult. Discussing these types of problems requires a graphical representation, and it is easier if the graphic is a physical picture of the situation. Video conferencing could help, but it was unavailable. Also, as mentioned before, we could not meet in one location without adding great expense to the survey.

Another problem was that we had difficulty accepting the responsibility of making a decision. Too often we would get someone else to approve a decision before moving forward. It also has something to do with the team members trusting each other. We would occasionally slip into our traditional roles, adding to the mistrust. I do believe this would have eventually subsided when we finally realized that we are professional land surveyors, we can make correct decisions and we can trust each others judgement.

This problem will also exist, depending on the individuals, in our revised format, until they become comfortable with accepting the full responsibility of the survey.

A fourth problem arose when Diane took leave of absence, and we tried to hand her duties to an inexperienced person. That person also had other duties associated with their regular job and could not devote the time to learn this one time project. We never fully recovered from this problem, and it caused a delay in producing the field notes. Eventually, Bob roughed out the corner descriptions on the computer and I formulated them into the field notes.

Some positives we had from the experience included: when the survey was final it did not go through another examination, survey problems were discussed and resolved as they came up, and each team member gained insight into the other member duties.

I would add that the team was filled with personnel at too high of a level, given the size and difficulty of the project. The survey team should have been assembled at the land surveyor level, and the unit chief serves as a coach, providing support for the team.

In California we are going to approach the team concept differently, because of what we tried with these pilots. We will have three levels: Management Team, Technical team and Survey Team. The Management Team includes the Branch Chief, Office Section Chief and Field Section Chief. They will have the responsibilities for: program guidance, budget, program planning, program coordination, and communication with BLM districts and other agencies.

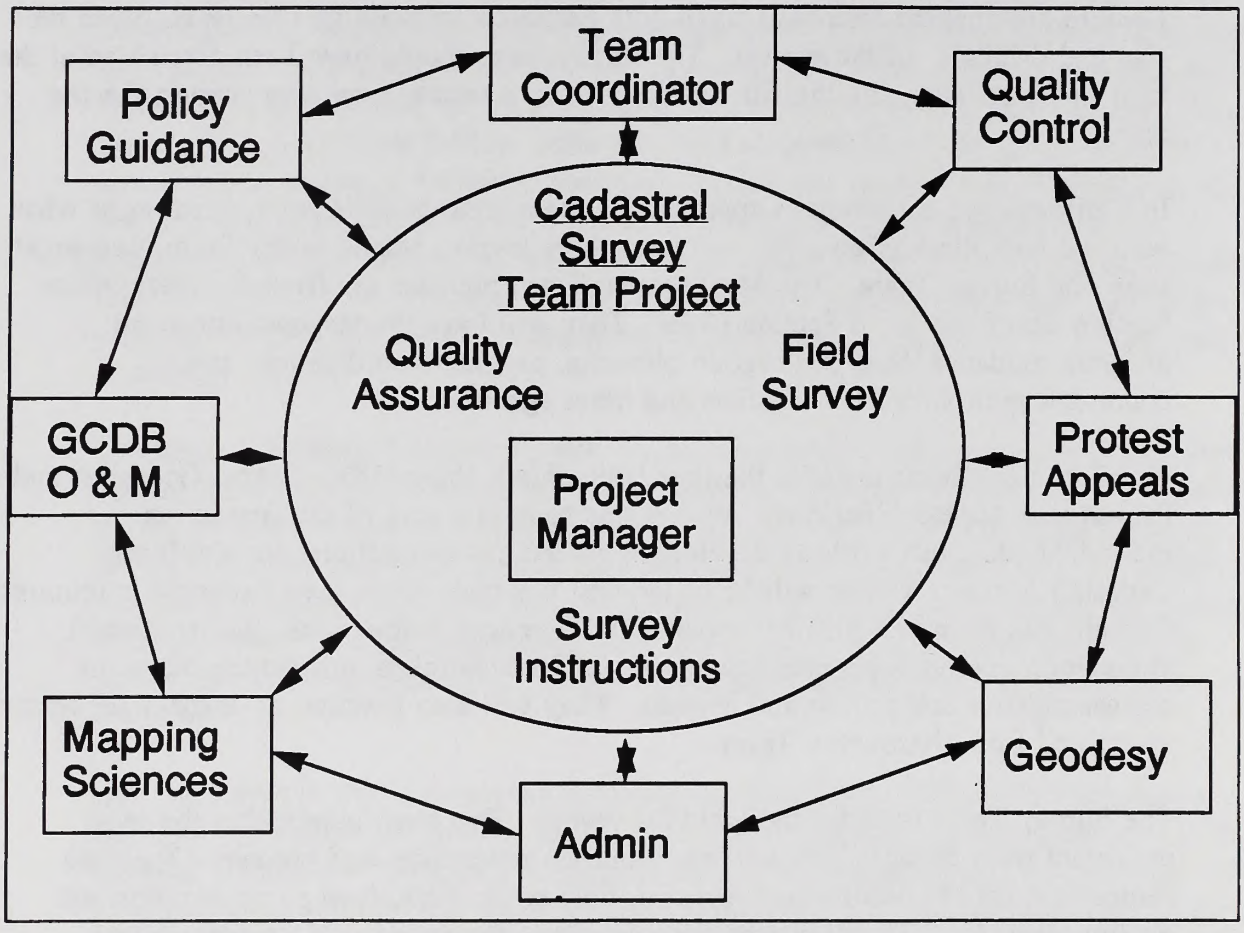
The Technical Team includes the four Unit Chiefs, three Office Leads, Geodesist and Protest and Appeals Specialist. Within this team is a core of the first seven individuals that will work on developing procedures and policies for California Cadastral Survey. Others will be called into this team when their expertise is required. Overall, this team will also be responsible for special instructions, quality control, automation coordination, cost estimates, supplemental plats, protraction diagrams, correspondence and protest and appeals. They will also function as coaches for teams assembled from the Survey Team.

The Survey Team includes the Land Surveyors. This team is probably the most important team because they will carry out the procedures and policies. They are responsible for the preliminary research, field work, GPS, final survey returns and quality assurance. They can also raise questions for developing procedures and policies that will improve the quality of Cadastral Survey.

If a team has a problem they cannot solve, they can elevate it to the coach or the Technical Team to solve. These problems should not involve day to day survey practices, not even mildly difficult situations. Elevating problems to a high level should be reserved for very difficult problems outside the teams expertise.

The organization that we are setting up in California should not be viewed as the answer for other states organization. It is one possible solution. We learned some lessons from our pilots and we changed accordingly. We will continue to make changes when we believe those changes will improve Cadastral Survey. Our goal is simple: make California Cadastral Survey into the best organization in BLM. We have the know how, the will and the support. Its time to change.

The California State Office Team Concept Model (May, 1994)



Findings, Recommendations and Discussion Based on Core Team Discussions

Regionalization of Survey Functions

Finding: Fiscal and human resources should be put to use where needed most based on customer requirements.

Recommendation: Maximize efficiencies in the use of land surveying resources through regionalization of management functions.

Discussion: The BLM has increasingly called for less oversight staff and direction of more resources to performance of on-the-ground work. At the same time, cadastral survey has seen retirement of managers and other key personnel at the branch level. Cost of performing field work continues to escalate due to increasing per diem rates and location of the work. With fewer personnel, there is a decline in responsiveness to customer's needs.

In response to these issues, the reengineering core team proposes the regionalization of authority/oversight positions and continuing the dissemination of field personnel to the lowest field level practicable. When work is needed in an area where no BLM personnel are available but another federal agency has land surveyors located, that work should be assigned to the other agency. In addition, should one State Office have available field crews they should be used in adjacent states if the need exists.

Cost: Not researched at this time, but it is presumed there would be an initial cost for personnel change-of-station moves.

Benefit: Decrease in overhead/administrative cost, increase in responsiveness to our customers, ability to limit travel expenses.

Manual of Surveying Instructions Rewrite & Development of 9600 Administrative Manual

Finding: The current Manual of Surveying Instructions, 1973 and the 9600 Administrative Manual is in need of revision.

Recommendation: Revise and update the Manual of Surveying Instructions to serve as a repository for technical issues guiding the Cadastral Surveyor in his/her work.

Recommendation: Resurrect and update the 9600 Manual.

Multi-tasking of Land Surveyors

Finding: Full implementation of the Core Team's proposals regarding team based survey projects, integrated review and base product format will lead to a changing role for the Cadastral surveyor. Off-season work of record preparation and review will be minimized to the point where other duties can and should be assigned.

Recommendation: Field surveyors should be assigned productive work in areas where there are identified needs. Cancellation of the GCDB collection contract has created a great need for increased utilization of in-house staff to perform initial collection and maintenance of GCDB. There is also a need for assistance in the elimination of backlogged surveys stuck in the review stage of the old survey process.

Discussion: The streamlining of the cadastral survey process proposed by the Core Team will present many opportunities for individual self-improvement and professional growth. The team based process combined with integrated review will minimize the need for extensive review after a field survey is complete. The proposed base product format will eliminate much of the record preparation time that normally follows field completion. Individual surveyors will have the time to expand into other related areas.

One area which could provide learning opportunities is in the examination of backlogged survey projects. Additional effort in this area would reduce existing backlog and serve as training in the requirements for final record preparation and the problems encountered during this process. In effect, the backlog would be decreased and the surveyor would become more capable in producing final products, thus helping to serve the goal of reducing the field-to-finish timeframe.

The Utah State Office's piloting of a combination of field, office and GCDB work demonstrates another way for Cadastral Survey to utilize that extra time. In that pilot, as field surveyors complete a field project they rotate to the office to complete record preparation and GCDB input for that project. At the same time, a surveyor in the office rotates back to the field to begin another survey project. This rotation of party chiefs and crews continues until the end of the field season, when record preparation for the last project is completed. The surveyor is then freed to perform GCDB data collection and O&M for the rest of the winter, maximizing utilization of existing staff.

The following Pilot Project details the effort being expended in Utah to implement this

finding and recommendation.

Utah State Office Pilot Project:
Multi-tasking Cadastral Surveyors

Background

The mission of Cadastral Survey is changing from a predominantly field oriented boundary survey organization to a spatial data base producer and caretaker. The role of the GCDB project was the impetus that initiated this change. The cadastral coordinate value data system needs to be accelerated to meet the Bureau's obligation for the National Spatial Data Infrastructure. These efforts will promote the Bureau's corporate agenda for serving current and future publics and promoting collaborative leadership. As GIS becomes more important in management the need for spatial data integrity will increase and the surveyor will be an integral part of this process.

The following presents a pilot proposal for reengineering of the entire field, office, and GCDB section for Utah in conjunction with the Cadastral Reengineering Project (Project) of the National Performance Review (NPR). Utah feels that this pilot plan will provide the setting for an extremely workable implementation of the ideas and concepts developed by the Project. A small state like Utah affords change in a quick and efficient manner. This would provide for an extremely beneficial working relationship for the Project.

Utah has consistently accomplished high productivity as measured by workload units. This efficiency is in spite of the fact that Utah has the smallest Cadastral Survey group in all of the BLM, with a budget to match. The GCDB section is an in house (non-contracted state), which allows for complete control and flexibility of automating and integrating survey data into the ALMRS processes. Many of the contracting administrative functions are non existent in Utah. The interaction of survey and GCDB has occurred naturally and the relationship continues to be symbiotic because of the similarity of the missions.

One of the major effort or goals of reengineering is to shorten the time period for the delivery of surveys and survey products to our customers. Our response to our customers for products through the work flow must become more efficient. The general process of field surveys to official plat and field notes to GCDB are best described as follows.

Current Practice

Each field survey is executed during the field season, spring through autumn months, and accumulated or stored until the off field season, winter months. During the winter months the surveys are compiled and forwarded to the review process for technical/legal evaluation, final plating and final note preparation. The review process is an ongoing process that feeds off the field surveyor's compiled surveys on a chronological basis or priority ranking. Finally the survey goes through the GCDB process either through the initial data collection or through maintenance and updating of GCDB.

An analogy may be drawn from production with raw materials (field surveys) being stockpiled for a finished product (official plats and field notes). This first finished product is stocked piled for the final finished product, GCDB. We are doing this through three basic processes (field surveys, review processing and GCDB compilation). The basic flow of work is not continuous but requires a warehousing of products at some stage and does not deliver final products in a timely manner.

The reason this current process has occurred is due to the need to produce as many surveys during the field season, spring through autumn months, as possible. Also and more importantly, the stockpiling of field surveys generated work for the field surveyor during the off season, winter months. The review process would receive an abundance of compiled field surveys during the last half of the winter months. This procedure produced a great amount of surveyed miles and survey monuments but did not deliver final products in a timely manner.

Proposal

Based on the lack of timeliness of final survey products and the advent of the GCDB project, there is an opportunity to modify the current process. We live in a society that has changed in customer expectations with regards to speed of delivery in providing services. The demand for quality is still paramount but the fast pace of exchanges, trespasses and other survey needs of our customers demands services and products in an expedited manner. The following proposed change for reengineering would meet most of our customers needs without degrading our quality.

A field survey would be performed during the field season, spring through autumn, however, after the field survey was completed the surveyor in charge would relinquish or transfer the field crew members to another surveyor. Then the surveyor leaving the field would immediately compile the field survey and pass it to the review process.

The review processor and surveyor would work together in producing the final products (official plat, field notes and GCDB) before any new survey is assigned to this surveyor. This process would continue throughout the field season, spring through autumn, with each survey crew being rotated through a surveyor in charge. During the off season (winter months) the field surveyors would finish processing their last job and then begin on processing GCDB townships. This method is generally straight forward in nature and would have been performed years ago, if there would have been work for the field surveyors to perform during the winter months.

The largest apparent drawback with this new flow of work would be in keeping a professional land surveyor away from the field during parts of the field season. This apparent lack of field production would be overcome by providing a surveyor to a field crew at all times during the field season, spring through fall. Surveyors would have to be cross trained between GCDB and field operations. This training would be minimal. Currently, most of the GCDB surveyors have substantial field experience and definitely understand the rectangular system. Field skills would have to be cultivated for some of the GCDB surveyors. The field surveyors would need some training on the GCDB software and procedures.

Utah implemented its pilot project in June, 1995. A Land Surveyor in the GCDB section was assigned Special Instructions to execute a dependent resurvey. Cross training in BLM survey procedures was accomplished on an as needed basis through collaboration with other field surveyors and review staff. Minimal training was required to effectively use CMM software because of its similarity to GMM in both concept and file structure. The surveyor was able to assign GCDB point IDs to corner points in advance to facilitate incorporation into the GCDB. Field surveyors were exposed to the successful use of GCDB coordinates as a tool for corner recovery and providing data for astronomic observations. Once the field portion of the survey was complete, the surveyor returned to the office to compile the data for final review and preparation of the final field notes and plat. The survey crew was assigned to another Land Surveyor.

Currently the surveyor is in the process of working with the Branch Chief and reviewer to identify requirements for final acceptance so that the time spent on review can be reduced. The group is also determining a new base product design that will eliminate duplication in the field notes and the plat without compromising legal requirements. The surveyor will be responsible for updating the GCDB with the new approved survey data.

To date, Utah's implementation of multi-tasking Land Surveyors has been a success. Some improvements to the process will be made as successes and failures are

identified, and as other engineering recommendations are implemented. Utah believes the broadening of skills through multi-tasking is extremely beneficial to both the Land Surveyor and the Bureau. Multi-tasking enhances individual career growth through cross training, takes advantage of an existing skill base within limited resources and reduces the delivery time of final survey products to meet our customers' needs.

Engineering the Geographic Coordinate Data Base - Operations and Maintenance

Background

The initial collection of the Bureau of Land Management's Geographic Coordinate Data Base (GCDB) is nearing completion in several states. (Initial collection is defined as the completion of township categories 1 through 4). As the spatial representation of the Public Land Survey System (PLSS), the GCDB provides for the registration of land status records to geographically referenced legal land parcels. This data base will comprise the Bureau's Land and Survey Theme (referred to in ALMRS as the "Land Theme"), and serve as the foundation upon which all record and resource information can be indexed. The data base will be available nationwide as a key component of the National Spatial Data Infrastructure (NSDI), serving federal, state, local and tribal governments, private industry, academia and the public.

The Land and Survey Theme will be a dynamic data base, and will, over time, accumulate coordinates of progressively higher quality. Once initial collection of the GCDB is completed and data conversion performed, the Bureau's emphasis will shift to the overall management, maintenance and coordination of the Land and Survey data base, or Operations and Maintenance (O&M).

The Cadastral Survey Reengineering National Performance Review (NPR) Lab was tasked to determine and design the Operations and Maintenance program's business requirements and procedures.

PURPOSE OF OPERATIONS AND MAINTENANCE

The purpose of Operations and Maintenance is to build and maintain the Bureau's Land and Survey Theme and provide accurate, cost effective spatial information for the PLSS that can be used as a common framework to support land and resource management across government agencies and private industry.

REENGINEERING OBJECTIVES FOR OPERATIONS AND MAINTENANCE

1. Identify and define all functions of O&M.
2. Identify requirements for partnerships and cooperative efforts for data exchange that meet both the Bureau's and its customers' needs for spatial land information and products.
3. Identify relationships with other Cadastral Survey processes and products.
4. Ensure that all automated processes of O&M are performed on the Modernization platform.
5. Determine the minimal set of basic automated capabilities that will meet user requirements through modeling of O&M processes.
6. Identify baseline digital products, reports and other special product needs, and provide capability to support other mapping products.
7. Identify relationships and impacts of O&M on other records functions within BLM.

Findings, Recommendations and Discussion

Functions of Operations and Maintenance (O&M)

Finding: The purpose of O&M is to build and maintain the Bureau's Land and Survey Theme as a common digital framework that will support land and resource management across government agencies and private industry through the National Spatial Data Infrastructure (NSDI). To achieve this objective, thirteen essential O&M functions have been identified.

Recommendation: The Bureau should continue to assume a leadership role and support national efforts in providing and managing spatial information through commitment to a fully operational O&M program. The identification and definition of these functions should be used as a benchmark in developing future mission, workload and funding strategies.

Discussion: The GCDB is a key component in building the base layer for the Bureau's Land Information System (LIS). This layer will be known as the Land and Survey Theme, providing for the registration of land status records to geographically referenced legal land parcels. Layers of different data themes will be added to this foundation to depict property

interests, resource values, management concerns and characteristics of individual land parcels.

There is a common misconception that once collection and data conversion is completed for all townships, the data base will be complete. This is true if the desired result is a static data base of decreasing value. Without continued collection and maintenance, the data base will be fragmented, incomplete and out-of-date. The L&S Theme must be continually collected and updated, and a process established for ongoing data maintenance as mandated by Executive Order 12906 (April 11, 1994).

O&M is a continuing effort to manage and populate a dynamic data base with current, high quality data. The functions of O&M are varied. They include quality assurance, ALMRS support functions, data collection, data updates, partnership management, products and services. There will be an increased demand for technical guidance in data acquisition, use and conflict resolution. O&M will require a mix of skills, primarily from the land surveying profession, but also incorporating lands, mapping sciences and GIS knowledge. Retaining appropriate staffing levels while maintaining a skilled and highly professional workforce will be critical to ensuring successful implementation of the O&M program.

The thirteen primary functions for the O&M of the Land and Survey Theme are identified and defined below. Input was obtained from technical advisors in GCDB, Mapping Sciences, ALMRS and the Federal Geographic Data Committee (FGDC).

1. **Collect land and survey information, build and update the Land and Survey Theme and Control Theme:**
   Collection includes the continued initial data collection of all township categories, including complexity 5 and 6 townships, uncollected complexity 1 through 4 townships, rights-of-way, easements, new parcels and new attributes. The new data will be integrated with existing data. Updating includes incorporating new control and/or survey data to update existing data, building land (the process of populating the corporate data base with spatial GCDB data and LLD attributes), performing adjustments, and updating attributes . Both internal and external data sources will be utilized in the update process.

2. **Build and maintain a Control Theme:**
   A positional control data base will be developed and maintained according to established data standards. Control gathered from both internal and external sources will be stored in the data base. This internal store will contain coordinate values and related information such as source, history, collection technique, positional accuracy,

and supporting monument records.

3. **Inventory and evaluate data from external sources:**
The Land and Survey Theme will be a shared data base which will continue to be improved through the contribution of data from external sources. One function of O&M will be to identify and inventory valid sources of data that can be incorporated into the Land and Survey or Control Themes. Sources will include other federal, state and local agencies through partnerships and cooperative agreements, as well as private entities. External data will be evaluated for methodology and consistency with data standards before being incorporated into the data base.

4. **Reformat and/or supplement data from external sources:**
This function involves the preparation of data received from external sources before it can be incorporated into the data base. For example, data may need to be reformatted or supplemented for naming conventions, conversion from plane to geodetic systems, unit and datum conversions, and merging different types of data.

5. **Identify and resolve conflicts between incoming coordinate data and land descriptions:**
Because the Legal Land Description (LLD) is compiled from BLM legal source documents which are not geographically referenced and the GCDB is computed geographically, differences will arise between these two sources of information as they are linked. Examples of conflicts include differences in LLD location versus GCDB location, and information that exists in LLD but not in GCDB, or vice versa. These conflicts will be identified and resolved through a consistent philosophy, based on management priorities.

6. **Improve Land and Survey data to meet data standards, fill in missing data, delete duplicated data:**
Initially, the data conversion process will flag problem areas where data is incomplete or fails to meet GCDB conversion standards. These problems will be resolved on a case by case basis as they are identified. In the long term, this function includes overall data base maintenance and coordination activities such as data improvement, data transfer, resolution of data quality issues, and quality assurance.

7. **Determine schedule for updates and provide notification of updates:**
Updates will be performed according to a predetermined schedule or as-needed, depending on management priorities. Notification of updates will occur before, during and after the update process so users can plan accordingly.

8. **Assist with the evaluation of impacts on other data themes from updates to the Land and Survey Theme:**
   Because the Land and Survey Theme is vertically integrated and/or related with many other themes, shifts in coordinates may cause other themes to shift. Timely notification of updates will be provided to other theme managers so that the impacts on other data themes from updates to the Land and Survey Theme can be evaluated.

9. **Verify, check, and correct updates made to the Land and Survey Theme:**
   Other functions will have the capability to update and expand the Land and Survey Theme to initiate land actions. This may include creating new land parcels through subdivision by a parcel generator, by metes and bounds traverses or by aggregating existing parcels into larger regions. These updates will need to be evaluated against source data to determine the adequacy of the land description, to determine if the subdivision method is acceptable and to determine if the reliability of the new or existing data supports the land action. A cadastral Supplemental Plat may be required and the data must meet established standards.

10. **Distribute digital data of the PLSS and Control data:**
    This function responds to internal and external requests for a digital copy of the PLSS and control for specific areas. Distributed data will satisfy the Federal Geographic Data Committee (FGDC) Spatial Data Transfer Standard and Cadastral Data Standards.

11. **Produce cartographic and report products:**
    Cartographic products include both standard and custom products. Standard products may include control diagrams and Protraction Diagrams as baseline Cadastral Survey products, as well as other cartographic products to support mapping. Other graphical depictions as defined by users will require custom products. Report products are alphanumeric reports such as inventories, update and process histories, statistics, and reliability reports, etc.

12. **Establish and execute partnerships for data sharing and exchange:**
    Establishing partnerships for data sharing and exchange will help the BLM to acquire the most accurate information available, reduce the duplication of data and reduce the expense of developing and maintaining a common data base. To facilitate data exchange, long term partnerships and cooperative agreements with other federal, state and county agencies will be arranged. This function includes training and user support.

13. **Assume Data Stewardship responsibilities to assure compliance with data standards and quality assurance procedures:**
This function provides data stewardship and coordination with BLM State Data and Records Administrators. The Data Steward will approve required documentation for automated data to attain "official agency record" status as the Bureau's digital representation of the PLSS, support the integrity of the data, assure the data fulfills administrative and statutory requirements, and authorize use of the data for BLM decision making.

O&M is being engineered for the first time. There is no existing business to reengineer. Using these functions as a design from which the O&M program can evolve will enable managers to accurately assess future program needs. Please refer to the issue/option paper "Strategy for Geographic Coordinate Data Collection and Maintenance" in the Appendix.

A fully operational O&M program will result in improved accuracy and quality in making complex management decisions concerning land, minerals and renewable resources. The BLM and other federal, state, local and private entities will be able to work from a common baseline of landnet information. Cooperative agreements for data exchange will be facilitated, reducing cost and duplication, and increasing efficiency and quality. The BLM, as a contributor to the National Geospatial Data Clearinghouse, will provide support to national efforts such as the FGDC and the National Spatial Data Infrastructure. Implementing a complete O&M program will help the BLM achieve its vision to efficiently and effectively manage spatial data.

Partnerships and Cooperative Efforts for Data Exchange

Finding: Executive Order 12906 requires the maximizing of cooperative participatory efforts with state, local, and tribal governments, the private sector, and other nonfederal organizations. OMB Revised Circular A-16 requires federal cooperation and identifies possible long-term federal partners. Guidelines have been issued by the Federal Geographic Data Committee to encourage establishment of data sharing agreements. Anticipated future funding levels to collect and maintain the GCDB will make partnerships a necessity if it is to remain a dynamic data base.

Recommendations: Efforts to build new partnerships with participants both inside and outside the government should be increased. Many state and local governments are developing their own data base with cadastral information. Those entities should be actively pursued and assisted in creating their data bases in a format acceptable to the GCDB. For those areas initially collected where there are limited federal interest lands, maintenance likely will be performed by the local governmental entities.

Discussion: Between EO 12906 and OMB Revised Circular A-16, federal agencies are mandated to cooperate with other entities in the establishment of the National Spatial Data Infrastructure (NSDI). The GCDB is the cadastral base layer not only for the Bureau's LIS, but also for the NSDI (GCDB is referred to as "boundary elements" in the EO). The EO calls for its use in the decennial census. Please refer to the Appendix for copies of EO 12906 and OMB Revised Circular A-16.

The benefits to data sharing agreements are many for all parties involved. There will be the most current and accurate information available for updates. Eliminating unnecessary duplication of effort will result in time and cost savings. There will be many efficiencies by sharing a common baseline of data (the land net). Data sharing also leads partners to develop consistent standards for defining and encoding cadastral data.

Existing data sharing agreements for GCDB spatial data have been compiled and distributed to the GCDB managers. The FGDC guidelines for data sharing were also included with this information.

GCDB Relationships with Cadastral Survey Processes and Products

Finding: GCDB is the spatial representation of the PLSS on the Bureau's automated LIS. As such, GCDB O&M is but a continuation of the traditional cadastral record production process. The production of the spatial component of the PLSS should be an integral part of that process as surveys, supplemental plats, or amended protraction diagrams are finalized and approved.

Recommendations: A seamless flow of data needs to be developed to truly complete an automated "field-to-finish" environment for cadastral records. The output from any of the cadastral processes should flow directly into the GCDB collection and update functions in a format acceptable for inclusion in the spatial database. A tie from existing software used in the survey processes, such as Cadastral Measurement Management (CMM) and AutoCAD, needs to be developed with the GCDB O&M software, GCDB Measurement Management (GMM). The GMM software should exist in both DOS and UNIX formats, so that O&M can be performed on the modernization platform and on personal computers (PCs) when needed.

Discussion: Almost all initial collection of GCDB information is being done in a manual environment. This is because the existing records, some dating back to the 1780s, exist only in paper form. This manual evaluation and entering of records to a spatial format is both time-consuming and costly.

Modern survey procedures utilize electronic instrumentation and recording devices, along with PCs for computation and evaluation. This allows for an almost totally automated field system, utilizing geodetically correct software such as CMM in the management of field data. Final production of the paper survey record is universally produced using AutoCAD software to draw the final plat. Files in CMM can be transferred to AutoCAD to produce the base drawing.

While these links exist between CMM and AutoCAD, there is no easy method to export final survey information, already geodetically correct and in digital format, to CMM's fraternal twin, GMM. There exists problems with file formats and data transfer which should be resolved and incorporated in the CMM-GMM atmosphere.

The GMM software itself presently only exists in the DOS format. This will suffice for counties or other publics to update the townships initially collected in GCDB where there are limited federal interest lands. BLM will have little need to maintain those townships as a dynamic data base. GMM should be produced in the UNIX format to allow it to rest on the modernization platform as the Bureau's O&M software for those townships we will be maintaining.

The advantages to hosting the GMM software on the modernization platform are in the form of time savings and data reliability. If a township to be updated has to be removed from the system, it would have to be converted back to DOS, updated in the DOS environment, then converted back to UNIX before finally updating the data base. This conversion is time-consuming and has the possibility of degrading the accuracy of the data.

GCDB O&M on the Modernization System

Finding: An analysis of the present system specifications for GCDB O&M on the Bureau's modernization platform indicates that the Automated Land and Minerals Record System (ALMRS) may not been sized to accept all the initial collection of GCDB spatial data, much less have the workspace capacity to perform O&M. There are presently no plans to host the O&M software on this system.

Recommendation: The Washington Office Geoscience Team should complete the sizing study initiated by the Core Team. Based on this study and the experience from the New Mexico IOC testing, the Systems Engineering Group at Denver-Washington Office should arrange for the sizing of the modernization system to accept all initial collection of GCDB information as well as provide the workspace to perform O&M.

Discussion: The reengineering team tasked themselves to ensure that all automated (or automatable) processes of O&M be performed on the Bureau's modernization platform. An analysis was performed to determine which of the anticipated classes of GCDB work could feasibly be performed on this system. These classes are discussed in the section on "Basic Automated Needs of O&M".

A sizing study was initiated by the Core Team to determine if the capacity detailed in the ALMRS RFP would be sufficient for initial storage and performance of these tasks. This study is using the experience gained during current collection efforts to determine estimated numbers of users per site, frequency of use, and the amount of storage per site. This study is only partially completed at this time and should be completed by the WO Geoscience Team by the spring of 1996. This information should be combined with the results of the New Mexico IOC testing to properly size the Geo-Spatial Database for storage and O&M functions.

Preliminary results of this study indicate that 6 gigabytes (GB) will be provided to each state for GCDB spatial storage. This may not be enough space for the initial data conversion and Build Land aspects of GCDB. No workspace has been allocated for GCDB O&M functions or the O&M software. It is anticipated approximately 1Gb will be needed per workstation to perform O&M.

The initial sizing need being discussed does not reflect the states bordering ("border states") those initially collected which should eventually be finished for the Bureau's completed portion of the National Spatial Data Infrastructure. There is no storage allocation for these border states. It is likely the amount of storage space necessary will equal if not exceed that needed for the states initially collected.

Corollary information gained during this analysis also indicated other aspects of the land theme in the ALMRS database are short of the storage requirements needed to fully implement an operational Land and Survey Theme. When the Build Land routine is completed, it is likely the GCDB Standard File Formats created from data conversion will need to be downloaded to make room for the build land ARC INFO files.

Basic Automated Needs for GCDB O&M

Finding: Executive Order 12906 mandates continued maintenance of geospatial data. The GCDB should be maintained as a dynamic data base, capable of being updated on the Bureau's modernization system. There are four basic classes of automatable GCDB O&M functions: New Collection (primarily of Category 5 & 6 Townships not previously

collected); Regional Adjustments; Update Control and Survey Data; and Spatial Displays/Alphanumeric Queries and Reports.

Recommendation: Logical modeling of these automatable O&M functions has been completed. As O&M for GCDB has never been performed before, these models should be manually tested and validated by a state office GCDB team. The Washington Office Geoscience Team should facilitate that testing. After testing, physical models should be produced and software developed so that O&M can be performed on the modernization platform. Many of the processes within these models can be performed by the GMM software, but the other processes not in that software need to have code written and graphical user interfaces developed for the entire package to fully take advantage of the platform.

Only the minimum O&M automated capabilities should be developed. Any further enhancements should be the responsibility of the individual states based on their specific needs.

Discussion: The automation of the base GCDB O&M functions using the process engineering models is a unique opportunity to "do it right the first time." The logical models produced for the GCDB O&M processes contain no after-the-fact reviews. Many traditional business processes have evolved to the point where the review of the work being done is as important, if not more so, than the actual work being performed. This type of system has led to an atmosphere of benign neglect by employees performing the work. Why do your best to produce an exemplary product if it will be revised many times after the actual work has been performed?

Because GCDB O&M has never been done before only logical models have been produced to date. It is anticipated that the testing and evaluation of these models will enable an automated physical process that includes quality assurance as an integral part of each work task. Testing, validating, physical modeling and production of a data dictionary will enable proper coding of software to perform O&M on the Bureau's modernization system. The logical models are attached at the end of this report.

The current GMM software contains many of the functions and quality assurance requirements necessary to perform O&M on the modernization platform. As a stand-alone software, the current capabilities would allow for O&M performance, but not easily. This software will need to be augmented with user interfaces and ties to existing databases to allow for a smoother, more easily performed O&M process.

Section 5 of Executive Order 12906 mandates ongoing data maintenance for geospatial data and specifically mentions boundary elements. Acceptance and development of this

recommendation would lead to the most efficient and least time consuming method to perform GCDB O&M and lead to bureau compliance with this executive order.

GCDB Baseline Products and Special Product Needs

Finding: Graphic and alphanumeric GCDB products support both public and private sector applications of geospatial data. The capability to produce some baseline products, such as Master Title Plats, other map products, diagrams and reports is already included in ALMRS specifications. However, standard products for specific program needs and special user-defined products beyond those included in ALMRS are required.

Recommendation: The GCDB program should fast track its efforts to identify and deliver products to customers on a priority basis in the interim before modernization. Assign a technical team to identify, define and develop baseline products that will meet specific program needs and that will provide a minimum base capable of supporting other mapping and special product needs. Develop a Products and Services User's Guide.

Discussion: One objective of the Core Team was to identify baseline digital products, reports and other special product needs. The results of the Reengineering Team's Customer Satisfaction Questionnaire indicated that GCDB data is predominantly used for mapping and GIS support, resource management and survey planning. Other applications of GCDB include project management and records support.

Mapping Applications: The GCDB is the official Public Land Survey (PLSS) layer for any hard copy or digital mapping product produced within the Department of the Interior. Other federal agencies, state, county and municipal governments are also users of the GCDB. The GCDB is a digital representation of the PLSS landnet, and when combined with ALMRS, provides the capability to automate land ownership on mapping products. This is very helpful to the BLM and other federal and state agencies involved in the definition and mapping of land ownership.

The GCDB is the framework for controlling and depicting land status portrayed on BLM and Forest Service hard copy and digital mapping products. Where available, the BLM is using the GCDB for the PLSS layer on its land status maps. The Idaho and Nevada State Offices are actively using GCDB to update BLM 100K maps. The Utah and Oregon State Offices are moving GCDB into ArcInfo for use in GIS support, Resource Management Plan (RMP) mapping, BLM 100K updates, and updates of the BLM and 1:1,000,000 statewide land status maps.

The Forest Service is using GCDB for revision of its Primary Base Series and Forest Visitor maps. The GCDB is the desired source for PLSS and protractions on Single Edition quadrangles covering Forest and adjoining areas. For each Primary Base Quadrangle produced, the Forest Service produces a Cartographic Feature File (CFF), a single layer digital product which provides the base data for Forest Service GIS applications and supports automated map production. Where available, the Forest Service includes GCDB in the CFFs.

The USGS has agreed to use GCDB as a principal landnet source for it's mapping. The GCDB is being incorporated into USGS topographic maps. The USGS also incorporates GCDB into Digital Line Graphs (DLG), which are multiple layer digital cartographic products used for automated map production and GIS support.

GIS Support: The identification of landline and boundary ownership within GIS and on hardcopy GIS products has been identified as one of the most critical land management data sets. DLGs and CFFs which incorporate the GCDB are a valuable source of data for GIS users within the private sector and at the federal, state, county and municipal levels. The GCDB contains geographic coordinates and many attributes which clearly portray the survey/boundary situation. Within the GIS environment, the PLSS and protraction systems provide an easily used reference grid and the framework for landownership. The inclusion of metadata such as coordinate reliability, survey type, corner type, etc. in the GCDB is of vital interest to the GIS community, and makes GCDB an invaluable tool for GIS users. The CFF and DLG do not presently include many of these desired attributes.

Resource Management: The GCDB is a critical data set for the preparation of Resource Management Plans (RMP), Environmental Impact Statements and Environmental Assessments. GCDB expedites the development of RMPs by supporting the use of GIS technology in the RMP process. Although each RMP will have its own specific data requirements, some data themes are common to all planning efforts. The PLSS landnet and land status are two base mapping themes needed to define the geographic area of the planning unit before any RMP analysis begins. The GCDB represents the PLSS landnet in a digital format; ALMRS contains the status component. Providing these data sets in a digital format precludes the planning team from spending additional time and money on preliminary data base development prior to starting the RMP.

The GCDB can provide a reference grid for location of such things as fires and HAZMAT sites and is valuable in evaluating leasing compliance and mining law administration. Survey coordinates and related GPS collection support resource protection, law enforcement, rangeland management, cultural resources, and land and realty management.

Survey Planning: The surveying community can use GCDB products for planning projects, research and corner location. The GCDB provides a compiled abstract of the latest survey record with related attributes such as surveyor, date and type of survey. Township diagrams with bearings and distances can graphically depict the record composite. Coordinates can be used as a corner search tool in conjunction with the Global Positioning System (GPS). Various GCDB plots can be made for field survey use such as orientation, corner location, reliability and other general information.

Program Management/Data Base Management: GCDB can be incorporated into project management software, such as USGS MAPINFO, which supports management through display and geographic referencing of types of surveys (protracted, surveyed, etc.) against 7.5 minute quads, 100Ks, forest boundaries, and other pertinent geographic information. This type of management GIS is a great tool for program management, identifying project responsibilities and priorities, and for managing cooperative efforts for data collection and map generation, such as BLM/FS cooperative efforts in developing amended protraction diagrams.

Records Support: The GCDB will serve as the PLSS source for Master Title Plat production on the BLM's modernization platform. The GCDB is also the primary source for the PLSS depicted on Forest Service Title and Encumbrance Plats, and where available, serves as the framework for the FS Automated Land Project (ALP).

The GCDB portion of the Customer Satisfaction Questionnaire indicated specific program and special products needs. Some standard products that may not be provided for in ALMRS could include the following:

- Data downloads in GMM format
- Control diagrams of the GCDB Control Data Base with control listings, with options to capture control data by category, status reports, currency, etc.
- GCDB check plots for quality control work and inventory purposes.
- Plots of conflicts between coordinate data and LLD legal description, topography, etc.
- Check plots for data theme managers to compare changes from O&M updates and assist in the evaluation of impacts to other dependent data themes.
- Hard copy reliability diagrams showing the reliability of selected coordinate points

for field use, overlays, etc.

- Alphanumeric reports such as coordinate listings, reliability, data abstracts, source information.
- A GIS to manage the O&M program. It would include classes of surveys, protracted areas, land administration, federal, state, and other boundaries, and project priorities for cooperating agencies.
- A translation program for the Forest Service Cartographic Feature File to GCDB and back.
- A national data base for control information.
- A routine using corner reliability to properly symbolize landnet classes used in automated mapping.
- Investigate elimination of found corner symbols from hard copy mapping/GIS products.
- Develop a network and bulletin board to provide basic information on program status, new developments, etc. This would facilitate coordination between users and cooperators involved in GCDB.
- Develop options for data and attributes to better meet specific needs of customers.
- Develop special packaging of GCDB data. Most users receive GCDB data by township and range. Special requests include data packaged by USGS quadrangle, county and National Forest/Parks.
- Develop GCDB exchange formats to commercial GIS software and drawing formats to import files directly into the software package.
- Provide customers with coordinate datum options. GCDB data is presently available in geographic, state plane and UTM coordinates, but the only datum available is NAD 27. Users want GCDB data in other datums (NAD 83, WGS 84, etc.). GCDB data should be current with GPS technology so that NAD 83 GPS coordinates do not have to be degraded to NAD 27 coordinates.

There is an increasing demand in both internal and external customer requests for geospatial products and services. The implementation of the BLM's modernization system

will provide many valuable products, but must be supplemented to ensure that specific program and special product needs are met. Any long term data collection process and the high dollars involved requires managing to have initial small successes and delivering products to customers as soon as possible. The GCDB program should fast track its efforts to identify and deliver products to customers on a priority basis in the interim before modernization. These products should range from basic data to more specialized variations.

Most State Offices have compiled a GCDB Users' Guide to assist customers in the use of GCDB data. Developing a GCDB Products and Services Guide will provide greater customer service as well as market GCDB products. Assigning a technical team to identify, define and develop these products will provide a way to satisfy customer requirements prior to and beyond implementation of the ALMRS system.

O&M Relationships and Impacts on Other BLM Record Functions

Finding: The Land and Survey Theme is a dynamic data base whose positional reliability will be improved through the O&M process. Shifts in coordinates will cause other dependent data themes that are vertically integrated with the L&S Theme to shift and may require the update of related records such as the LLD (legal land descriptions), Master Title Plats, and historical indices. Gross discrepancies may require a survey to correct the official record.

Recommendation: Provide timely notification of O&M updates to internal and external customers through an online notification system on the modernization platform. Establish a team in each BLM State Office that is composed of technical representatives from affected data themes and record functions to identify issues, evaluate impacts and resolve conflicts.

Discussion: The Land and Survey Theme (referred to in ALMRS as the Land Theme) is a dynamic data base that will continually accumulate coordinates of progressively higher quality through the O&M process. Current, high quality data is crucial to support both public and private sector applications of geospatial data.

Data themes which are directly or partially vertically integrated with the Land and Survey Theme (L&S Theme) will be impacted when coordinates are updated during O&M. Conflicts will arise between updated coordinate solutions and other data themes that are referenced to or have some basis in the Public Land Survey System (PLSS). Substantial coordinate adjustments will cause significant impacts on some records and resource

themes. Such conflicts will require evaluation, analysis and resolution.

Land and mineral records are directly vertically integrated to the L&S Theme. GCDB coordinates are computed geographically and linked to record source documents that are not geographically referenced. Land and mineral records are based on legal descriptions referenced to or directly tied to the PLSS. O&M updates may alter land and mineral record locations relative to the GCDB and require new legal descriptions. Geopolitical boundaries which follow the PLSS are another example of vertically integrated themes, and may include district, state and county lines.

Many resource themes are partially vertically integrated with the L&S Theme because they are tied to or have some other reference to the PLSS. For example, on a road system theme, a road that follows a section line or crosses a section corner would be affected.

Distribution of update notifications should include system, internal and external notification that occurs before, during and after the update process. Coordinate and alphanumeric data for the area being evaluated should be "checked out" and flagged to warn users that the data is subject to update.

Implementing this recommendation will allow affected theme managers to assist each other in analyzing and resolving impacts to their respective themes before O&M updates are checked back in to the ALMRS L&S Theme and accepted as the official digital record. Providing timely notification of O&M updates will allow users to plan accordingly.

Supplemental Issues:

Priority Issues No. 1 & 2 (combined)

Streamlining section subdivision

The setting of 1/4 section corners and 1/16 section corner monuments which control or define Federal interest lands.

"Running" all subdivision of section lines.

Desired Result: Monument only those positions which define the boundaries of Federal interest lands. Preclude the "running" of unnecessary subdivision-of-section lines. The direction and length of all interior section lines may be ascertained by indirect measurement once proper control is established on the exterior boundaries of the section.

Status: Completed; Elevated to a major finding.

Approved Instruction Memorandum No. 95-152, Expires 09/30/96

Priority Issue No. 3
Software development and documentation

Desired Result: Standardized and well documented software that is user friendly and incorporates all appropriate user interfaces and requirements.

Status: Ongoing; Elevated to a major finding.
Requires preparation of a concept paper for submission to the Project Review Board for approval to proceed.

Priority Issue No. 4
Training relative to automation

Desired Results:
Develop a Cadastral software training program that provides quality training in Cadastral Measurement Management (CMM), GCDB Measurement Management (GMM), Cadastral Electronic Field Book (CEFB), AutoCAD, and Global Positioning System technology (GPS).
Develop and publish a list of available automation training

Status: Ongoing; Elevated to a major finding.
Issue paper has been forwarded to PRB for approval.

Discussion: Over the past 18 months, employees from the Bureau of Land Management (BLM), Bureau of Indian Affairs, the Forest Service, with input from customer service questionnaires, performed a structured business process reengineering of the cadastral survey processes. In addition to examining a number of issues to increase productivity, the National Performance Review, Cadastral Lab is piloting and testing the new processes. The following information is a result of this effort and will result in cost and time saving changes in the way the BLM conducts its Federal Cadastral Survey function.

One of the issues raised by the Cadastral Reengineering Core Team was a need to develop a quality training course covering the topics of cadastral survey's automated systems. These systems include, but are not limited to; Cadastral Measurement Management, Geographic Measurement Management, Cadastral Electronic Field Book, Cadastral Automated Plat Drafting, and Automated Field Notes.

In 1994, the Core Team conducted a "Peer Group Questionnaire" to ascertain what could be done to improve services offered by cadastral survey. The need for training was a common thread showing up in the results. For example, question 1 was concerned with saving time. A common theme from respondents was increased use of automation including better training in its use. Question 2 dealt with cost savings. Here again, the need for automation appears as a common thread. Question 3 was concerned specifically with automation. Here again the need was identified to improve our existing systems to make them more efficient and effective. Training is a major component necessary to take full advantage of these automated systems. Page lV of the results of the peer group questionnaire results, titled Opinions We All Have One!, states: "[k]nowledge of Word Perfect was adequate or better. For all other packages and processes, however, a significant number of respondents (ranging from 36% to 72%) indicated that their knowledge was marginal or inadequate, and they needed more training." The results of the questionnaire demonstrate a strong need for training in cadastral's automated systems if we are to gain the full benefits of efficiency and effectiveness. In 1992, cadastral survey, through the National Training Center (NTC), conducted a formal needs assessment to help determine what training courses were needed. The final report of this assessment, dated October 1, 1992, indicates a need for automation training as well as setting standards for software and its use.

The Core Team has contacted Diane Nelson, Cadastral Survey Coordinator, NTC to discuss this issue. As there are many levels as well as methods to deliver this training, it was determined that an outline be developed which would assist in making these decisions. We have prepared an outline of the choices which can be used to determine the type of training best suited to meet the desired results. This can be best accomplished after the needs assessment is completed. The needs assessment can be ascertained form past surveys conducted by the NTC and Core Team, a new formal survey specific to automation, or an informal polling by each state.

This outline (refer to the Appendix) is intended to represent the most efficient means to provide training in the automated systems which have been developed by cadastral survey. Three major categories of training are presented, multimedia, formal classroom at NTC, and on site at student's duty station, with both positive and negative implications.

The PRB should decide, based on the needs assessment, which training is desired and best suits the needs and available resources as well as the delivery method. Once this is accomplished, a course can be designed to meet the needs.

Regardless of which training methods are selected, if instructors are involved, they

should be trained to properly conduct this work. The NTC offers a course to all NTC instructors which provides various teaching techniques. It is a fact that simply being skilled in a particular field does not necessarily make one a good instructor.

Priority Issue No. 5, 7, 25 (combined)
19% Administrative Overhead Surcharge
Untimely transfer of 9800 funding
Inefficient and costly billing practices for reimbursable clients

Desired Results:
Suspension/Waiver of Overhead Charges on reimbursable accounts.
Reduction in overhead charges.
Detailed explanation of overhead charges.

Desired Results:
Immediate transfer of funds.
Ability to code directly to agency.

Desired Results: Ability at the field level to charge directly to benefiting agency for work provided, i.e. T&A's, travel, vehicles, etc.

Status: Information Bulletin is awaiting signature. The IB does not present solutions to the issues but does provide guidance and information.

Priority Issue No. 6
Closing against pre-existing surveys

Desired Result: No unnecessary retracement or resurvey of adjacent lines for closure purposes only.

Status: Completed
Approved Instruction Memorandum No. 95-154, expires 09/30/96

Discussion: When the issue of closing against the record was raised by the Core Team (CT) in Phoenix Arizona as a possible area to be reengineered, it was assumed that all of Cadastral Survey had this requirement as part of a normal project. It was also understood what closing against the record intended. We soon found out there were many interpretations of this requirement and its application varied widely within

Cadastral Survey.

As part of the research into this issue, the CT sent a FAX to all Cadastral Chiefs asking for any in house policies and any comments which they or their staff may have. The responses to the FAX was quite varied with respect to interpretation of this issue. This issue also made its way to the Cadastral Survey Bulletin Board (BBS) where some limited responses were given.

From the feedback received, it became very apparent that a further definition needed to be given or simply broaden the issue to include the various interpretations. It was decided that broadening the definition would best answer the issue and provide the best recommendation to the Project Review Board (PRB).

The issue of closing against the record will now be defined by two major categories: One, using an official record to form the basis of closure for a new survey; Two, the need to close a new survey against the adjoining record survey.

Refer to the Appendix for complete discussion and examples and a copy of the approved Instruction Memorandum..

Priority Issue No. 8
Corrections to the record of the Official Survey

Desired Result: The ability to make notation or correction on the face of the plat or notes.

Status: Ongoing
Concept remanded to Core Team for further study; sent to Solicitor for legal interpretation.

Priority Issue No. 9
Stewardship of Public Land Survey System records

Desired Result: Maintain the Public Land Survey System records in an automated environment.

Status: Deleted
After further contemplation, the Core Team determined this to be a statement and not an NPR issue. No further action to be taken.

Priority Issue No. 10
Corrective resurveys on private land where a previous BLM Survey missed original evidence, or made a blunder and thus infringed on the bona fide rights of the landowners.

Desired Result: Clarification of responsibility to make corrections to approved surveys.

Status: Deleted
The Core Team determined that BLM has no authority to conduct surveys on private land. No further action to be taken.

Priority Issue No. 11
Digital records

Desired Result: All states produce the final survey records in digital format

Status: Ongoing
Requires preparation of a concept paper for submission to the Project Review Board for approval to proceed.

Refer to the Appendix for a draft concept/issue paper on this issue.

Priority Issue No. 12
Technical services contracts

Desired Result: The ability to utilize technical services contracts in performing cadastral surveys when appropriate.

Status: Dropped
Concept not approved by the Project Review Board.

Priority Issue No. 13
FTE restrictions

Desired Result: Remove restriction on FTE if funding is available.

Status: Deleted
The NPR advised all Labs to avoid addressing the FTE issue. No further action to be taken.

Priority Issue No. 14
The use of coordinates in surveying

Desired Result: Coordinates become part of the evidence of the corner.

Status: Ongoing
Requires preparation of a concept paper for submission to the Project Review Board for approval to proceed.

Priority Issue No. 15
Ties to Federally owned Interstate Highway rights-of-way

Desired Result: Tie to right-of-way as a topographic feature only, unless requesting agency requires lotting for management purposes.

Status: Completed
Approved Instruction Memorandum No. 95-151, Expires 09/30/96

Priority Issue No. 16
Closing corners

Desired Result: Give closing corners equal value as other corners on same line once a careful retracement of the line has been made.

Status: Deleted
This was determined to be inconsistent with court decisions and prudent survey practice. No further action to be taken.

Priority Issue No. 17
The number "17" was inadvertently left out of the numerical sequence. There is no Issue No. 17.

Priority Issue No. 18
Timeliness in hiring temporary employees

Desired Result: Hire in a more efficient and timely manner.

Status: Deleted
This was determined to be an OPM issue. No further action to be taken.

Priority Issue No. 19
Regionalization of survey functions

Desired Result: Maximize efficiencies in the use of land surveying resources through regionalization of management functions.

Status: Completed; Elevated to a major finding.
Passed to the Interagency Cadastral Coordination Council Executive Committee Concept Team.

Priority Issue No. 20
Limited authority for contracting

Desired Result: Increase warrant authority to the State Offices for contracting.

Status: Deleted
Warrant authority doubled by IM WO-95-165. No further action to be taken.

Priority Issue No. 21
Procurement policies
1. Credit card limits and authority
2. GSA contract items
3. Telephone purchasing authority

Desired Result: Have the necessary dollar limits and authority at the operational level to make purchases at competitive costs.

Status: Deleted

This issue has been addressed; purchasing authority has been increased with the use of credit cards. No further action to be taken.

Priority Issue No. 22
Plat filed with or without public notice. Current policy is use of Federal Register notice.

Desired Result: Clarify the needs and requirements for public notice and determine the appropriate means to accomplish this.

Status: Deleted
Concept not approved by the Project Review Board.

Priority Issue No. 23
Cost recovery for data maintenance/stewardship of information.

Desired Result: Establish appropriate fees for data retrieval in order to create funding to upgrade data base as technology changes.

Status: Deleted
Concept not approved by the Project Review Board.

Priority Issue No. 24
Bearing trees (BT) & other cadastral survey corner accessories

Desired Results:
Do not give the full compliment of scribe marks on BT's.
Affix nail and metal washer embossed with "BLM" at the base of tree or scribe the tree "BT" at base
Use DEEP-1 magnetic locators in lieu of natural accessories as prescribed by the Manual
Eliminate accessories, and when necessary to reestablish the position, measure from nearest controlling corners.

Status: Deleted
Determined to be imprudent survey practice. No further action to be taken.

Priority Issue No. 26
Administrative automation

Desired Result: Under development

Status: Ongoing
Requires preparation of a concept paper for submission to the Project Review Board for approval to proceed.

Priority Issue No. 27 & 30 (combined)
Manual rewrite & update of 9600 Administrative Manual

Desired Result: Produce an up to date Manual of Surveying Instructions.

Desired Result: Create a permanent repository for official Cadastral Survey policy.

Status: Ongoing
Elevated to a major finding.

Priority Issue No. 28
5% Rule

Desired Result: Show true acreage for all federal interest aliquot parts on the plats of dependent resurveys. Follow the present rule and only change the legal description of an aliquot part when the acreage change exceeds 5%.

Status: Deleted
Concept not approved by the Project Review Board.

Discussion: Manual Section 9-86 advises that on dependent resurvey plats the acreage of an aliquot part should not be changed unless there is a variation of 2 acres in a quarter-quarter section (5%). This administrative requirement first appeared in the 1947 Manual and seems to have its origin in the pre-calculator/computer days when it was impractical to compute acreage with ease. Our customers increasingly are wanting to know the exact acreage of an aliquot part for determination of value in land exchanges or for leasing purposes.

This proposal would provide the option for aliquot parts to have their true acreage

shown on dependent resurvey plats. Their legal descriptions would remain the same, e.g., they would still be referred to as the aliquot part they always have been-the acreage would just be different than an even 40, 80, etc. The legal description might read, "the SW 1/4 SW 1/4 of Sec. 13, consisting of 38.91 acres..." Where the difference in acreage exceeds the 5% limitation, a lot number will still be assigned to describe the parcel.

Priority Issue No. 29
Determine mechanism with which to recoup equipment costs on reimbursable surveys.

Desired Result: Undeveloped

Status: Deleted
Deleted after further contemplation by the Core Team. No further action to be taken.

Priority Issue No. 31
45 chain rule

Desired Result: Eliminate the requirement to establish monumentation at 45 chain minimums.

Status: Deleted
Concept not approved by the Project Review Board.

Discussion: The Manual of Surveying Instructions, 1973, Section 7-16.

This section is entitled **Metes-and-Bounds Surveys**. It prescribes that monuments on surveyed boundaries should not be more that 45 chains apart. Many states have applied this rule to all surveys. Many times when partially subdividing a section only the E-W center line is needed to delineate federal interest land. The Special Instructions will call for a monument to be established on this line to satisfy the 45 chain rule.

This practice is due to a misinterpretation of the Manual and application of rules for metes-and-bounds surveys to rectangular surveys. This requirement adds to the cost of a survey. If additional monuments are not required by the customer they should not be established.

Priority Issue No. 32
Wyoming records Imaging

Desired Result: Have Wyoming historical field notes and plats scanned instead of placed on microfiche.

Status: Ongoing
Requires preparation of a concept paper for submission to the Project Review Board for approval to proceed.

Priority Issue No. 33
Reposition/relocate original mineral surveys in relation to the Public Land Survey System.

Desired Result: Develop a mechanism for updating the public record when additional information becomes available.

Status: Tabled - to be reviewed at a later date
Concept approved by the Project Review Board for additional research

Priority Issue No. 34
Legal description in independent resurveys

Desired Result: Provide a mechanism to retain legal description of patented lands when performing an independent resurvey.

Status: Deleted
The Core Team failed to reach concensus on this issue. No further action to be taken.

Discussion: Manual Section 6-33 gives guidelines in the tracting of private claims when an independent resurvey is performed. Those guidelines call for a new legal description for patented lands, with each valid claim given a tract designation beginning with number 37 in order to avoid confusion with section numbers. It is normal to provide an "Index to Segregated Tracts" on the plat to equate the former legal subdivision with the new tract designation as detailed is Manual Sections 9-87 to 98. This changing of the legal description for patented lands can cause confusion for the affected landowner, title companies, and local taxing agencies.

This proposal would call for the ending of the policy of giving patented lands,

originally described as aliquot parts, tract numbers in the independent resurvey. The patented lands would retain their original legal description. The new sections in the independent resurvey would be numbered beginning with section 37 in the Northeast corner of the township and continue the numbering in the normal manner ending with section 72 in the Southwest corner of the township. In this way there will be no confusion as to the status and location of the patented lands.

Priority Issue No. 35
NAD 27 vs. NAD 83

Desired Result: Adopt NAD 83 as the datum for all cadastral surveys.

Status: Ongoing
Concept approved by the Project Review Board for additional research

Discussion: The Cadastral Reengineering Core Team has identified the issue of adopting the NAD 83 datum as the datum used by Cadastral Survey. Past policies which support reporting data in NAD 27 were addressed in Instruction Memorandums No. 88-358 and No. 88-567. Neither I.M. fully investigated the future of Cadastral as to the use of NAD 83; their purpose was to clarify a policy. This paper will investigate the adoption of NAD 83 as the datum for all cadastral surveys.

There are a variety of reasons to support the use of NAD 83 in cadastral surveys. These reasons are a mix of technical, practical, and political considerations. There is also a misunderstanding as to which NAD 83 value should be used as the base datum. Following are some of the reasons to use NAD 83.

- NAD 83 is closely related to the coordinate system used by the GPS (WGS84). NAVSTAR satellites use WGS 84 as their reference system. The Defense Mapping Agency designed WGS 84 with the intent that positions computed on that system would be identical to positions computed on the NAD 83. It can be said that for practical purposes the WGS 84 and NAD 83 are based on the same ellipsoid. Therefore, all GPS related computations can be done on the NAD 83, with no conversion or transformation necessary.

- NAD 27 accuracies are not sufficient and distort measuring capabilities. The highest order that a survey can be performed referencing NAD 27 NGS Control network is at best 1/100,000. Today electronic measuring devices, such as GPS receivers, routinely measure to an accuracy that exceeds 1/100,000. Thus, performing GPS operations off NAD 27 control networks often distorts/dilutes

accuracies that can be obtained by GPS. The main reason NAD 27 datum distorts data is due to the way the network grew after the 1927 adjustment. After 1927 new 1st, 2nd, and 3rd order networks were not subjected to a least squares adjustment, so their misclosures, along with older larger networks, were distributed into the newer networks. Errors grew large and were spread into every new network. Also, error analysis was not performed resulting in a network loaded with unpredictable, large systematic errors.

- NAD 27 transformations increase performance time and the complexity of projects. Processing GPS data from field to finish takes time, skill, and judgement. Projects can take one day to several days. NAD 27 transformations require editing, coordinate value entries, and evaluation of results. A day of work can easily be added to a project in computing datum transformations. Transformation routines are at best accurate to +/- 1 meter, and therefore dilute the original coordinate accuracy.

- The increasing use of GPS/NAD 83 coordinates. One of the first professional groups to use the NAVSTAR system was the surveying community. Within the surveying community, and in the BLM, the Cadastral Survey program took on a leadership role in the use of the GPS system. Since that time the number of professions and organizations using GPS receivers have escalated. All future users will be feeding data into the NAD 83 datum. The WGS 84 and NAD 83 data base is growing with every GPS receiver in use. For continuing Cadastral Survey leadership in use of new technology, the NAD 83 should be adopted for all future surveys.

- Interagency coordination and partnerships. Most state governments have adopted NAD 83 as the datum for their use. An increasing number of public and private concerns are also using NAD 83. In the future, data-sharing partnerships will be important as the number of FTEs and dollars available to perform both field surveys and spatial data maintenance shrink. Prospective partners in these arrangements will mainly be using NAD 83. The issue of the GCDB existing as a NAD 27 data base is not addressed in this paper. The same reasons for NAD 83 use in cadastral surveys are also true for the GCDB, especially where data sharing partnerships are concerned.

One misunderstanding about NAD 83 is the existence of newer adjustments for that datum. As High Accuracy GPS Reference Networks (HARN) or High Precision GPS Networks (HPGN) are developed in an area, a new adjustment relative to the network is developed and the year of publication of the new data is added to the datum

description. For instance, in Colorado the datum to be used in NAD 83 (92), while in Oregon the datum is NAD 83 (91). Both these datums are based on the same ellipsoid and are consistent with each other. These are the values for NAD 83 which should be used.

The elimination of NAD 27 coordinate transfers and working directly in NAD 83 HARN or HPGN will better serve present and future clients. Cadastral Survey should adopt NAD 83 as the datum for all future work.

Priority Issue No. 36
Definition of new base product

Desired Result: Based on customer needs, a detailed examination of current products useability, format, and content should be initiated with follow-up recommendations for a new base product which meets the minimum legal requirements and eliminates self-imposed requirements which are not value added.

Status: Ongoing
Recommendations made an integral part of this report.
See pages 28-33.

Priority Issue No. 37
Redefinition of "limits of closure"

Desired Result: Use of error ellipses and positional tolerances in determining the limits of closure.

Status: Tabled
Concept is tabled until the rewrite of the Manual of Surveying Instructions, 1973

Priority Issue No. 38
Use of private survey data (records)

Desired Result: The ability to use acceptable private survey records in the preparation of supplemental plats and other uses where appropriate.

Status: Ongoing
Forwarded to the Solicitor for legal opinion

Applied Structured Analysis: The Reimbursable Dependent Resurvey Model

Introduction:

This section of the report details the Applied Structured Analysis process and specifically the reengineering process of the Reimbursable Dependent Resurvey (RDR) business event. These surveys are done for BLM customers and other federal agencies, i.e. Bureau of Indian Affairs, Bureau of Reclamation, National Park Service, Fish and Wildlife Service, Corps of Engineers and the U.S. Forest Service. BLM has a legislative mandate to perform property surveys for these agencies; we are the only agency empowered by Congress to perform such surveys.

Background

The first phase of the reengineering process was to create the *current physical models* for six different business events. A total of seven business events were originally scheduled; GPS survey requests were dropped as a business event. These business events and the required parameters for reengineering are documented in the NPR Cadastral Survey Reengineering Charter. The models show the current physical design and processes employed to produce dependent resurveys, original surveys, supplemental plats, protraction diagrams, as well as contracting for survey services and the operation and maintenance of the geodetic coordinate data base (GCDB O&M). They identify the physical processes from the time we receive a request for services to when the customer receives the final product.

The models that were developed take into consideration all the state's versions of producing survey products. They are not intended to be an exact reflection of what happens in any one particular state, but reflects a worst-case scenario; they are by necessity generic in nature.

This first phase also identifies project delays. For example, these delays could be an unattended in-basket, or it could be where the project is put on hold until an examiner can be scheduled or delayed during examination due to higher priority projects. The most notable stops were between the completion of the field work and production of draft documents, and between receipt of draft records in the examination unit and the scheduled start date of the examination. These delays could add many months if not years to producing a final survey. It is apparent that this is unacceptable to both our internal and external customers.

The second phase produced the *current logical models*, which identify how the work would be done if there were no physical entity doing the work. In other words, when one process is finished it moves to the next process, and so on, until a final product is produced without all the delays associated the current production design. With the delays eliminated you can study

the processes and decide which ones are value added. If very little or no value is added by a process than it is looked at for modification or elimination.

During the second phase the Core Team realized that the task of modeling all identified business practices would be both complex and time consuming. The business practices list was analyzed and modified to produce the most benefit. It was decided that contracting was a tool that could be used in any of the models to produce a final product. However, any contracting model would necessarily include more review and examination to maintain product integrity. Alaska currently employs contracting very successfully and has done so for over 20 years. The Alaska model is the basis for a successful training program. The contract modeling process was delayed to concentrate on more pressing events. Supplemental plats are a small part (< 20%) of our overall business and was likewise delayed. These events will be looked at in the future. Protraction diagrams were already being studied and modeled by another group. Operations and management of the GCDB was changed from reengineering to engineering of the process, because no information existed to produce the models and the models and the process is being built for the first time. This business event proved to be a time consuming venture in its own right. From this point, only the reimbursable dependent resurvey went to the third phase of modeling process - the *future logical model.*

The *future logical model* represents a streamlined process outline for production of survey products. Duplication of effort identified in the two previous models were combined or eliminated. Our model is basically a combined future logical and *future physical model.*

Future Physical Model

The future physical model consists of three distinct parts. First is the context diagram, followed by two child diagrams, 1.0 and 3.0, "define survey" and "perform field dependent resurvey", respectively. While this is not a "physical" diagram in the strictest sense, it does represent the processes required during a reimbursable dependent resurvey. A true "physical" diagram would include all the technical and design specifications required for implementation. The Core Team has proposed automating as much of the process as possible. This initial vision included an automated survey record data base, automated project cost estimation and an automated project tracking system. These proposals were not adopted by the Project Review Board and thus have not been developed in the physical model. Other teams and study groups within the Bureau (ALMRS/LIS, automation, GCDB, etc.) are working independently to determine future design and system specifications for Bureau operating systems. We have made recommendations on the design and implementation of the Geographic Coordinate Data Base Operations and Maintenance (GCDB O&M) process specifications.

The context diagram outlines the five major events transpiring during this business event: 1)

defining the survey with all it's technical and legal requirements in consort with the requestor, 2) authorizing the survey, an inherently Federal function, 3) performing the field work, 4) approving the survey record, also an inherently Federal function, and, 5) GCDB O&M. The process specifications for the GCDB O&M process are being engineered for the first time as part of this NPR initiative and are addressed earlier in this report. What appears to be missing from this business event model is the third inherently Federal function: review of the technical and legal requirements of the survey prior to approval. Review has been replaced as a separate "end of the pipeline" process and spread throughout the entire survey. The primary reasons for this realignment are increased timeliness of final product delivery and to eliminate duplication of review and the necessity of returning to the field to correct errors and/or omissions.

The child diagrams represent a distillation of the processes shown on the context diagram. Child diagram 1.0, define survey, is relatively self explanatory. Process specifications are more detailed and represent the lowest level of business event decomposition determined necessary by the NPR team. We term this the "cultural level," the level at which no further definition is required for a professional land surveyor trained in the Public Land Survey System. Included in this child diagram is a fourth inherently Federal function: preparation of technical direction. You may well recognize this as preparation of "Special Instructions."

The process specification for 2.0, authorize survey, is included in the Data Dictionary Elements (DDE).

Perform Field Dependent Resurvey, Child Diagram 3.0, details the process specifications for the actual field implementation of the survey instructions. Process Specification 3.8, formatted data, is incomplete as it depends on adoption of base product definitions and GCDB O&M specifications. However, through standardized software packages, data can be used for plat and note production as well as feeding directly to GCDB and ALMRS.

Approve survey, process specification 4.0, is also defined in the DDE. The NPR team has investigated the possibility of using electronic signatures for survey approval and have found it both legal and viable as an alternative to the traditional pen and ink signature.

Design Structure, Futuring and Recommendations

The Reimbursable Dependent Resurvey model (RDR) has been examined relative to the criteria presented in the team charter. The RDR is a basic business event which can be used with relatively minor changes to represent an original survey or dependent resurvey done with inhouse survey staff. Modified slightly, it can be used as a base for contracting these same

survey functions (contracting being a tool and not a "survey" process).

The initial focus of the Core Team was on automation of process specifications. Dr. Michael Hammer, interviewed in the September, 1995, issue of Government Technology, states that "without the creative use of technology, there is no reengineering." This is a view shared by the Core Team. We discussed and recommended to the Project Review Board several opportunities to automate process specifications.

The Team's automation strategy includes the following:

- Automated Survey Request
- Automated Initial Survey Cost/Time Estimate
- Automated Historical Data Base
- Human Validation of Automated Processes
- Automated Application of:
  - Authority: U.S. Code, CFR, Etc.
  - Authorization: Approval of Notice to Proceed
  - Accounting Information
  - Assignment of Personnel
- Automated Records Search/Retrieval Capability
- Quality Assurance vs. Quality Control
- Formatting and Editing Data:
  - Data Direct to ALMRS/GCDB
  - Final Positions
  - Final Bearing, Distance, Area & Coordinates
- Approval Process
- Automated Notification and Filing

The entire process is predicated on a shift from command and control to team based participative management, and getting away from quality control and focusing on quality assurance.

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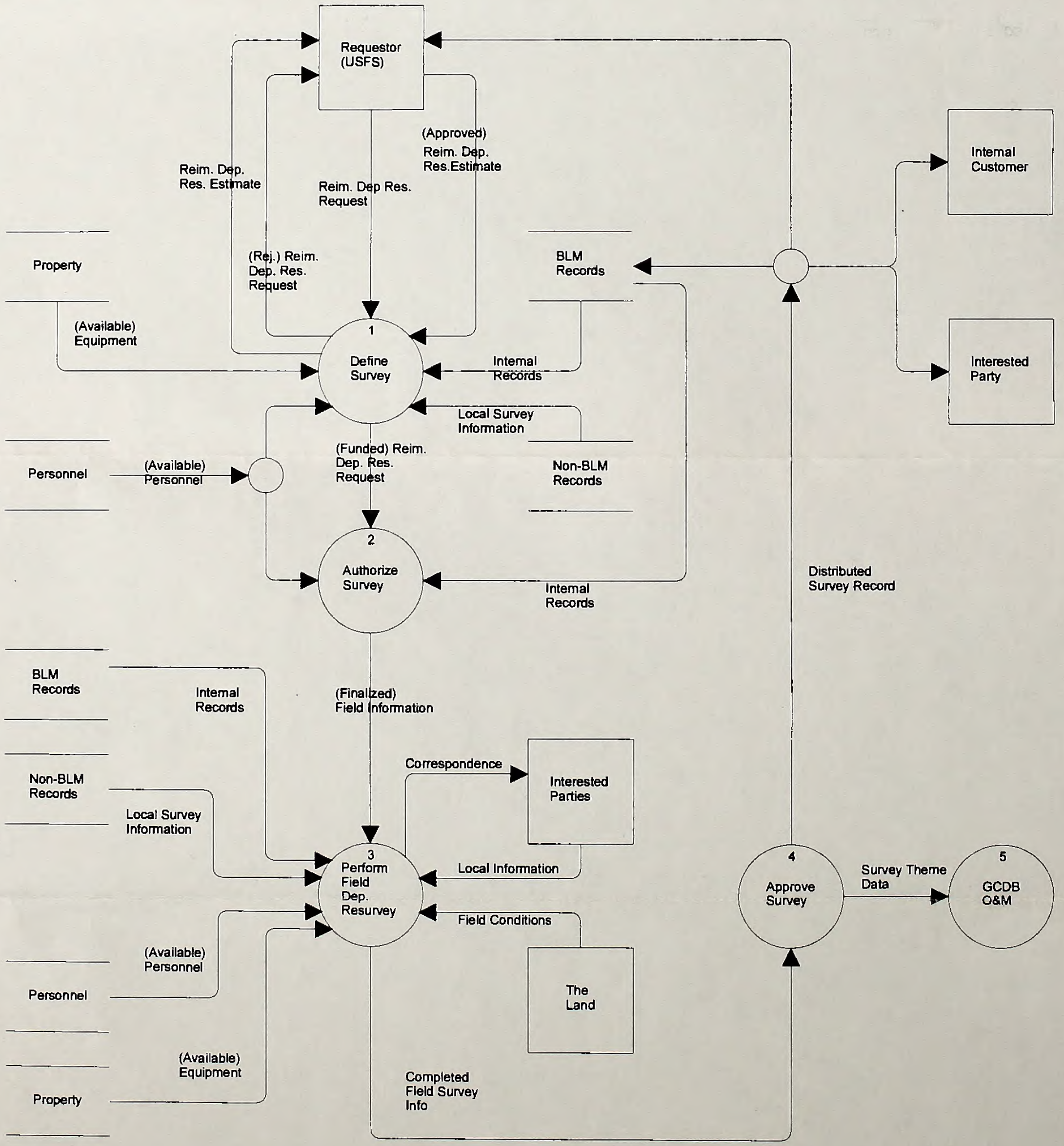
Project Name:	Future Physical RDR
Project Path:	c:\npr\ecwin\rdrphys\
Chart File:	dfd00001.dfd
Chart Name:	Future Physical Context RDR
Created On:	Dec-27-1994
Created By:	Frank A. Hardt
Modified On:	Oct-03-1995
Modified By:	Frank A. Hardt

Future Physical Context Diagram
9800 REIMBURSABLE DEPENDENT RESURVEY

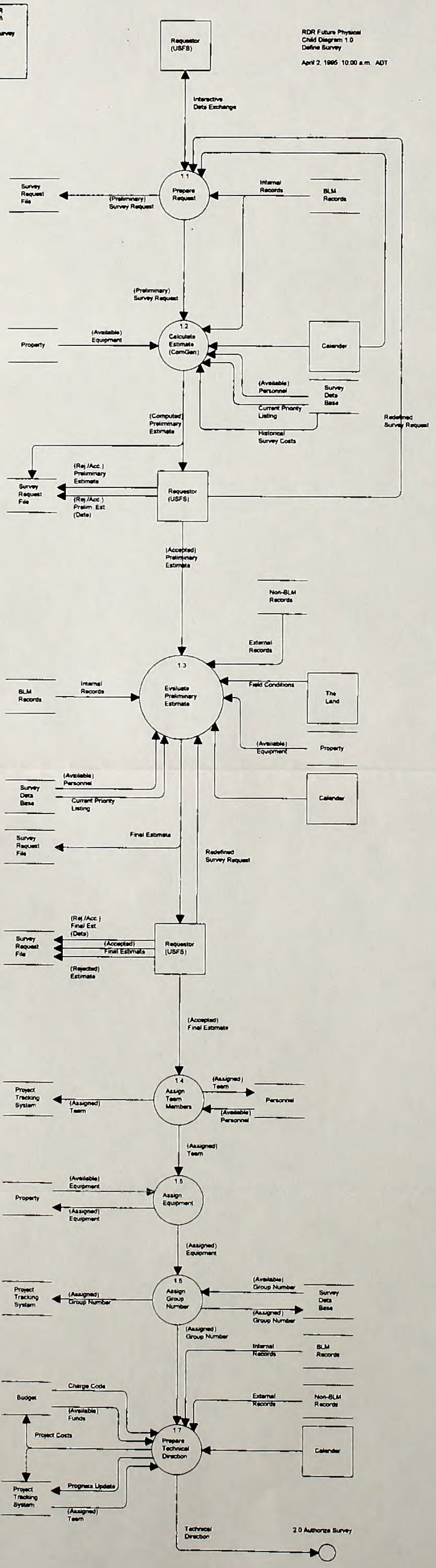
June 9, 1995 8:15 em AST



Project Name:	Future Physical RDR
Project Path:	c:\ngis\access\rdr\phys\
Chart File:	dfd00004.dfd
Chart Name:	RDR Child Define Survey
Created On:	Dec-28-1994
Created By:	Frank A. Hardt
Modified On:	Apr-28-1995
Modified By:	Frank A. Hardt

RDR Future Physical
Child Diagram 1.0
Define Survey

April 2, 1995 10:00 a.m. ADT



Project Name: Future Physical RDR
Project Path: c:\rap\data\dmp\phys\
Chart File: dfd00000.dfd
Chart Name: Perform Field Dep. Resurvey
Created On: Dec-09-1994
Created By: Frank A. Hanft
Modified On: Apr-28-1995
Modified By: Frank A. Hanft

RDR Future Physical
Child Diagram 3.0
Perform Field Dependent Resurvey

April 28, 1995 10:35 a.m. ADT

Authorize Survey
Process Spec: 2.0

(Finalized)
Office
Information

3.1
Contact
Interested
Party

(Assigned)
Team

Project
Tracking
System

Survey
Notification
Data

Notice of
Survey
Commencement

Requestor
(USFS)

Interested
Party

Local Information

External
Records

Non-BLM
Records

Internal
Records

BLM
Records

Calendar

Specified
Requirement

3.2
Perform
Field
Reconnaissance

(Available)
Funds

Budget

Charge Code

Project Costs

Progress Update

(Assigned)
Team

Survey
Commencement
Data

Property

(Assigned)
Equipment

Field Conditions

Access Request
Response

Access Request

The
Land

Interested
Party

Internal
Records

BLM
Records

External
Records

Non-BLM
Records

Confirmed
Access
Information

Recovered
Additional
Evidence

Recomputed
Search Areas

3.3
Search
for/Evaluate
Evidence

(Available)
Funds

Budget

Charge Code

Project Costs

Progress Update

(Assigned)
Team

Property

(Assigned)
Equipment

Field Conditions

The
Land

Calendar

Internal
Records

BLM
Records

External
Records

Non-BLM
Records

Evaluated
Survey Evidence

Recovered
Additional
Evidence

3.4
Collect
Physical
Measurement

(Available)
Funds

Budget

Charge Code

Project Costs

Progress Update

(Assigned)
Team

Property

(Assigned)
Equipment

Field Conditions

The
Land

Calendar

Internal
Records

BLM
Records

External
Records

Non-BLM
Records

Collected
Physical
Measurement

Approve Survey
Process Spec: 4.0

Formatted Data

3.8
Format
Data

(Available)
Funds

Budget

Charge Code

Project Costs

Progress Update

(Assigned)
Team

Survey Summary
Data

Property

Assigned
Equipment

Calendar

Completed
Field Survey
Info

3.7
Set
Corn Mark
Lines

(Available)
Funds

Budget

Charge Code

Project Costs

Progress Update

(Assigned)
Team

Field Completion
Data

Property

(Assigned)
Equipment

Monumented
Corner Positions

Marked Lines

Field Completion
Notification

Calendar

The
Land

Requestor
(USFS)

Internal
Records

BLM
Records

External
Records

Non-BLM
Records

(Computed)
Corner Positions

3.6
Compute
Corner
Positions

(Available)
Funds

Budget

Charge Code

Project Costs

Progress Update

(Assigned)
Team

Property

(Assigned)
Equipment

Calendar

Internal
Records

BLM
Records

External
Records

Non-BLM
Records

Computed
Spatial
Relationship

3.5
Compute
Spatial
Relationship

(Available)
Funds

Budget

Charge Code

Project Costs

Progress Update

(Assigned)
Team

Property

(Assigned)
Equipment

Calendar

Modeling of GCDB O&M Functions

Introduction:

Modeling of GCDB functions which could be automated began at a later date than the rest of the reengineering effort. The initial Core Team membership did not include individuals with enough expertise in GCDB to assist in creating an ***engineered*** design for GCDB O&M.

While the GCDB is the base layer for the BLM's LIS, it cannot be forgotten it is also the base for the "boundary elements" portion of the NSDI called for in EO 12906. As such, the GCDB will enjoy extensive use by other federal and nonfederal partners.

Process:

The engineering of GCDB O&M functions was and continues to be a challenge as the GCDB is still in the initial collection phase. There have been limited efforts to perform data base maintenance to date. Because there is no current process to use as a base from which to develop future models, the usual process associated with the use of Applied Structural Analysis (ASA) could not be followed.

While this lack of a current process constrained initial attempts to begin modeling, it also presents the opportunity to design an automated system with integrated quality assurance that eliminates the need for validation and verification after the task is performed. In effect, this lack of process history assists in that there are no vested interests in the continuation of a current system.

The initial task involved identifying the classes of O&M functions which could be automated. Following are the classes for which models were prepared:

A. New Collection (Raw Data Collection)

This covers new collection of raw data in all township categories, including category 5 and 6 townships, easements, new parcels, and new attributes. This would include fitting to existing data.

B. Regional Adjustments (Smoothing)

The least squares adjustment of large blocks of townships for the purpose of distributing error throughout a region. This will usually be done after rework of a smaller area. This could include coverage of one or more counties or other block

configurations.

C. Update Control and Survey Data (Smaller Adjustment Sets)

The adjustment of a region with new control data or updating of existing data with new survey or resurvey data. This will also include updates to attribute data and inclusion of external and internal stores for updating purposes.

E. Spatial Displays and Alphanumeric (A/N) Queries and Reports (Unique O&M Spatial Displays and Data Downloads)

The production of baseline and custom maps, diagrams, and reports for quality control or other inventory purposes. This would include display of update solutions for review by affected theme managers. These displays would be in place of or in addition to current GCDB status so solutions and effects could be demonstrated. This would also include retrieving of GCDB data for field survey purposes or to answer queries that output A/N data, such as land statistics.

One other automatable function initially considered for which some modeling was produced was amended protraction diagrams. Another study group has already been working on that process and has produced software for this procedure, so work on this item was discontinued.

In scoping the development of these models, it was decided only the minimum functions necessary to perform O&M would be developed. Any further enhancements to meet individual state or user needs will have to be developed by those entities.

The models that follow should be considered as untested future logical models for GCDB O&M, even though they may not be "logical" in the strict definition of ASA terms. Because of the very nature of creating a process for the first time, these models should be tested by one or two state office GCDB staffs to assure that all the proper requirements of "what" we should do in this work is present. Once this testing and validation is completed, future physical models, the "how" we do it, should be developed so coding of software can be performed.

No data dictionary was produced for these models. They can be produced at the completion of the validation process when any adjustments which may be needed are made. These models are fairly self-explanatory and can be understood by the GCDB professional at the "cultural level" of knowledge.

Two different models were created for classes (scenarios) A, B, and C; processes with and

without subdivision. This was done so that coding could be performed for Alaska, where there will be no subdivisions in many areas. It may be discovered during the testing or code writing process that a separate scenario is not necessary.

Full "child diagrams" representing the expansion of the process "bubbles" within scenario A were produced. An interesting aspect of the software used to produce the models flagged all processes with identical names in all the models produced. An analysis of this flagging indicated the models produced for scenario C are practically identical to scenario A except for one process bubble. The testing may determine the procedure to perform these scenarios are identical and eliminate one model.

The Core Group has recommended that one or two state offices be tasked with the testing and assistance in preparation of the future logical models. The Washington Office Geoscience Team should be assigned responsibility for assuring this testing, future modeling, and software encoding takes place.

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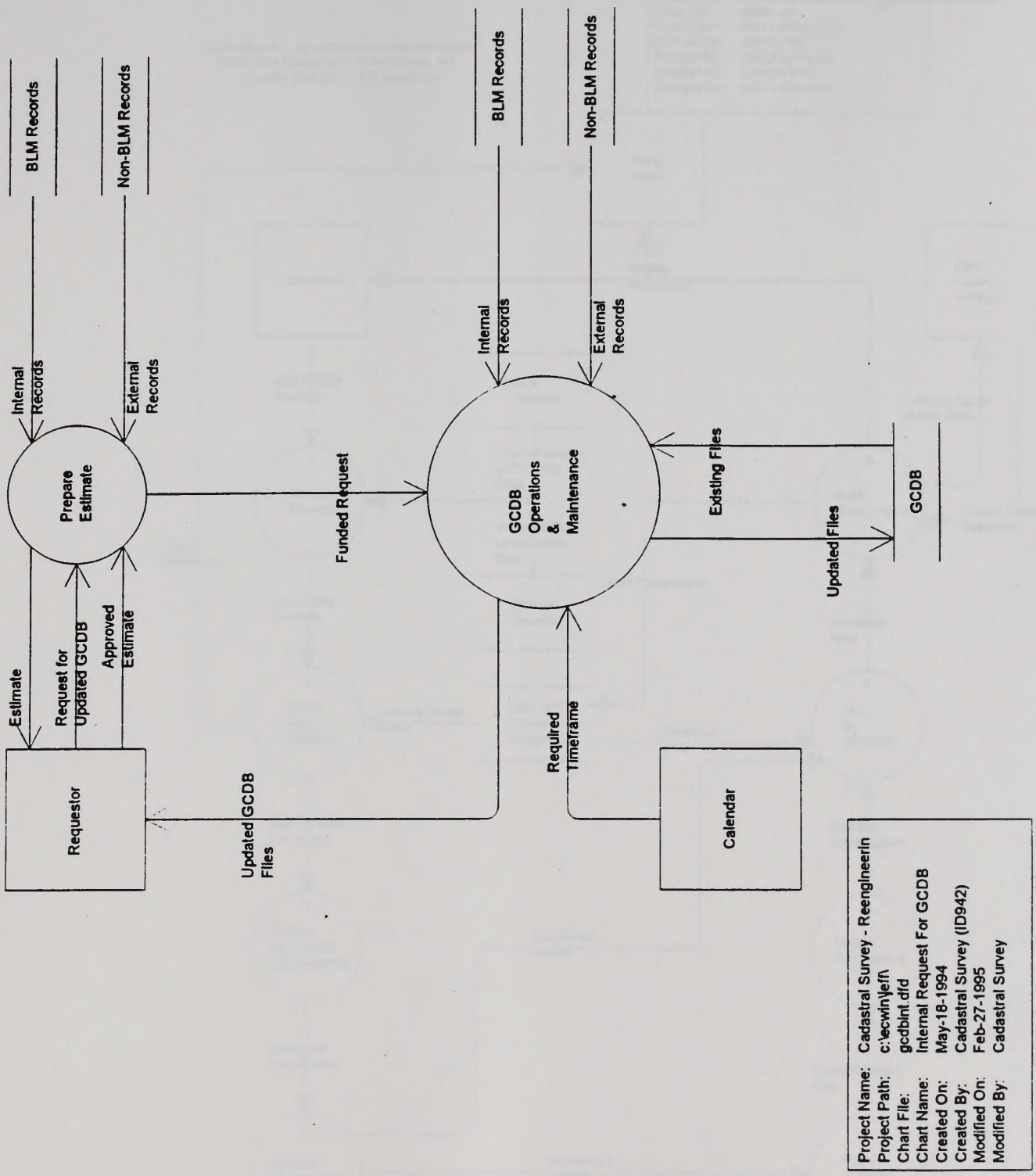
BLM Records
Non-BLM Records
Internal Records
External Records
Prepare Estimate
Funded Request
GCDB Operations & Maintenance
Existing Files
Updated Files
GCDB
Estimate
Request for Updated GCDB
Approved Estimate
Requestor
Updated GCDB Files
Required Timeframe
Calendar
Project Name: Cadastral Survey - ReengIneerIn
Project Path: c:\ecwin\elf\
Chart File: gcdbint.dfd
Chart Name: Internal Request For GCDB
Created On: May-18-1994
Created By: Cadastral Survey (ID942)
Modified On: Feb-27-1995
Modified By: Cadastral Survey

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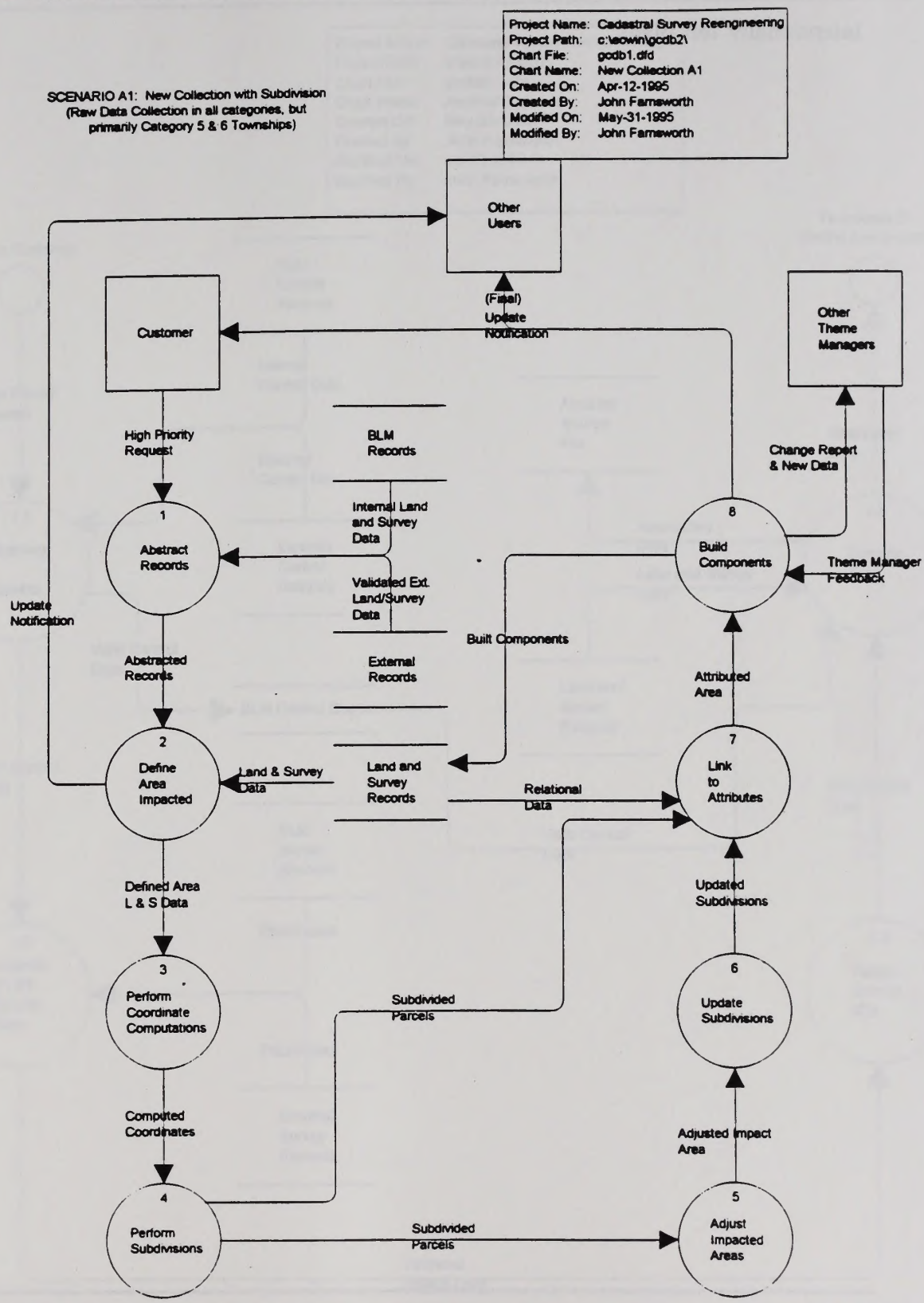
Project Name: Cadastral Survey Reengineering
Project Path: c:\eowin\gcdb2\
Chart File: godb1.dfd
Chart Name: New Collection A1
Created On: Apr-12-1995
Created By: John Farnsworth
Modified On: May-31-1995
Modified By: John Farnsworth
SCENARIO A1: New Collection with Subdivision
(Raw Data Collection in all categones, but
primarily Category 5 & 6 Townships)
Other Users
Customer
(Final) Update Notification
Other Theme Managers
High Priority Request
BLM Records
Internal Land and Survey Data
Validated Ext. Land/Survey Data
External Records
Land and Survey Records
Change Report & New Data
Theme Manager Feedback
Built Components
Update Notification
Abstracted Records
Land & Survey Data
Relational Data
Attributed Area
Defined Area L & S Data
Updated Subdivisions
Subdivided Parcels
Computed Coordinates
Adjusted Impact Area
Subdivided Parcels
1
Abstract Records
2
Define Area Impacted
3
Perform Coordinate Computations
4
Perform Subdivisions
5
Adjust Impacted Areas
6
Update Subdivisions
7
Link to Attributes
8
Build Components

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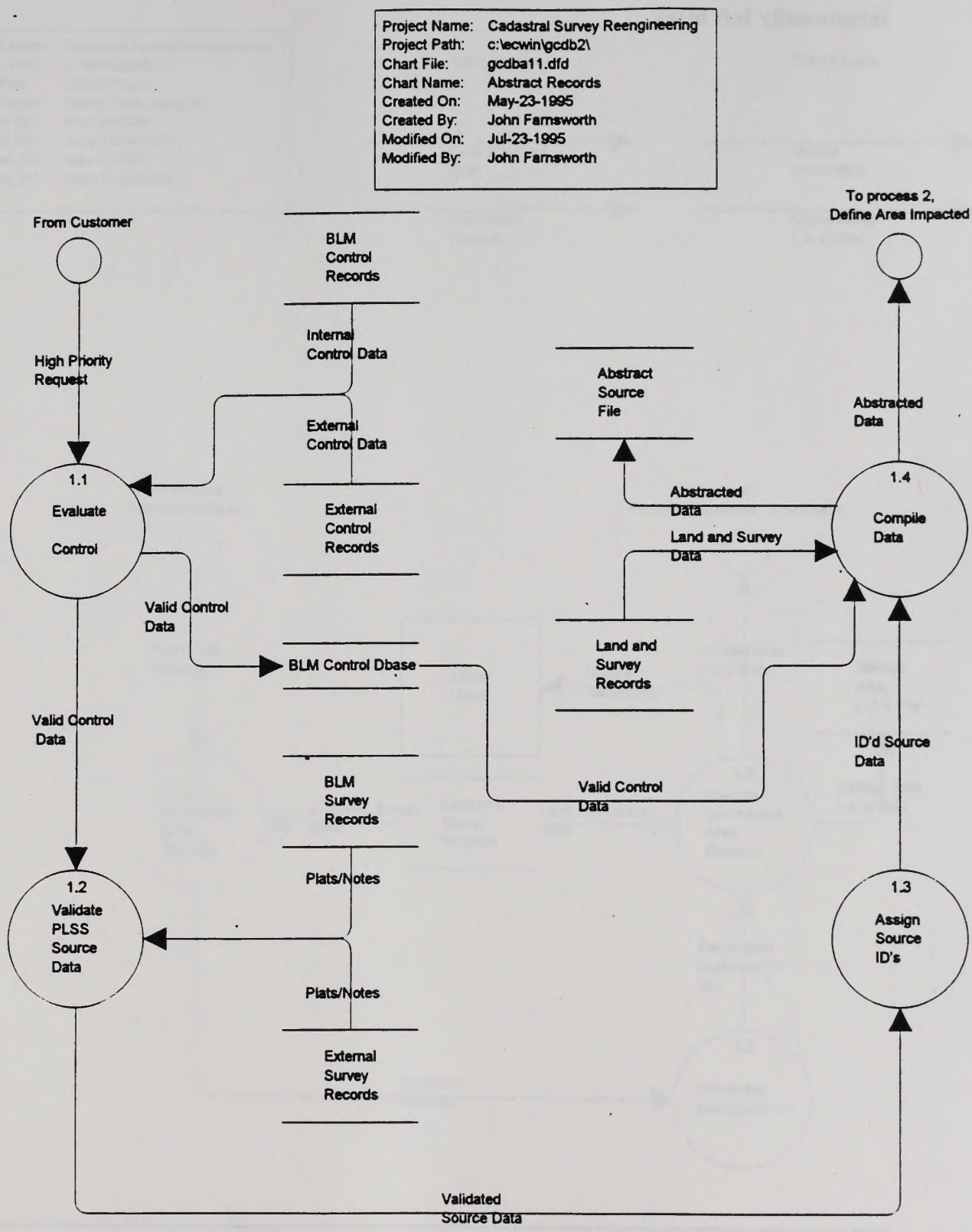
Project Name: Cadastral Survey Reengineering
Project Path: c:\ecwin\gcdb2\
Chart File: gcdba11.dfd
Chart Name: Abstract Records
Created On: May-23-1995
Created By: John Farnsworth
Modified On: Jul-23-1995
Modified By: John Farnsworth
From Customer
High Priority Request
BLM Control Records
Internal Control Data
External Control Data
External Control Records
1.1 Evaluate Control
Valid Control Data
BLM Control Dbase
Valid Control Data
BLM Survey Records
Plats/Notes
1.2 Validate PLSS Source Data
Plats/Notes
External Survey Records
Validated Source Data
Abstract Source File
Abstracted Data
Land and Survey Data
Land and Survey Records
Valid Control Data
1.4 Compile Data
Abstracted Data
To process 2, Define Area Impacted
ID'd Source Data
1.3 Assign Source ID's

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Project Name:	Cadastral Survey Reengineering
Project Path:	c:\ecwin\gcdb2\
Chart File:	dfd00015.dfd
Chart Name:	Define Area Impacted
Created On:	May-24-1995
Created By:	John Farnsworth
Modified On:	Jun-19-1995
Modified By:	John Farnsworth

Input Flows

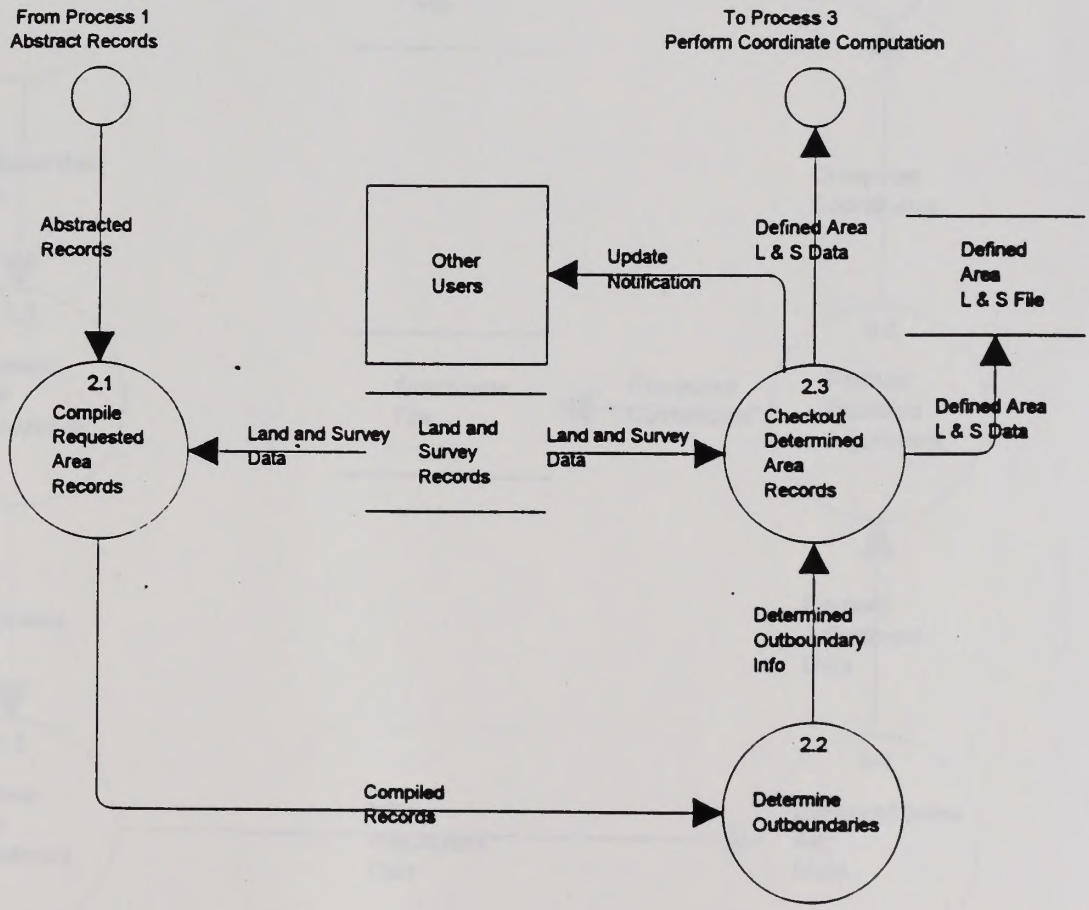
Land & Survey Data

Abstracted Records

Output Flows

Update Notification

Defined Area L & S Data



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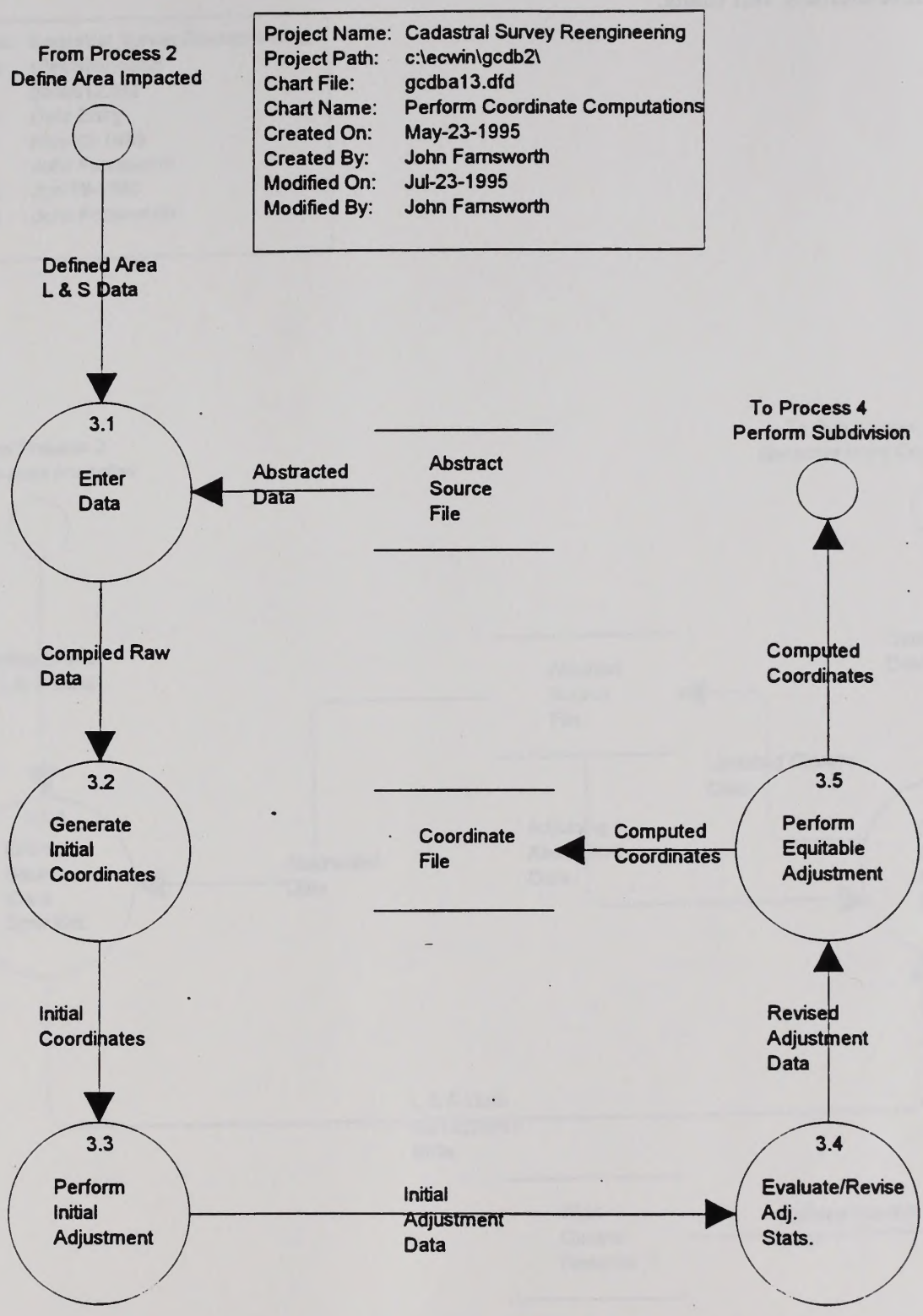
Project Name: Cadastral Survey Reengineering
Project Path: c:\ecwin\gcdb2\
Chart File: gcdba13.dfd
Chart Name: Perform Coordinate Computations
Created On: May-23-1995
Created By: John Farnsworth
Modified On: Jul-23-1995
Modified By: John Farnsworth
From Process 2
Define Area Impacted
Defined Area
L & S Data
3.1
Enter
Data
Abstracted
Data
Abstract
Source
File
To Process 4
Perform Subdivision
Compiled Raw
Data
Computed
Coordinates
3.2
Generate
Initial
Coordinates
Coordinate
File
Computed
Coordinates
3.5
Perform
Equitable
Adjustment
Initial
Coordinates
Revised
Adjustment
Data
3.3
Perform
Initial
Adjustment
Initial
Adjustment
Data
3.4
Evaluate/Revise
Adj.
Stats.

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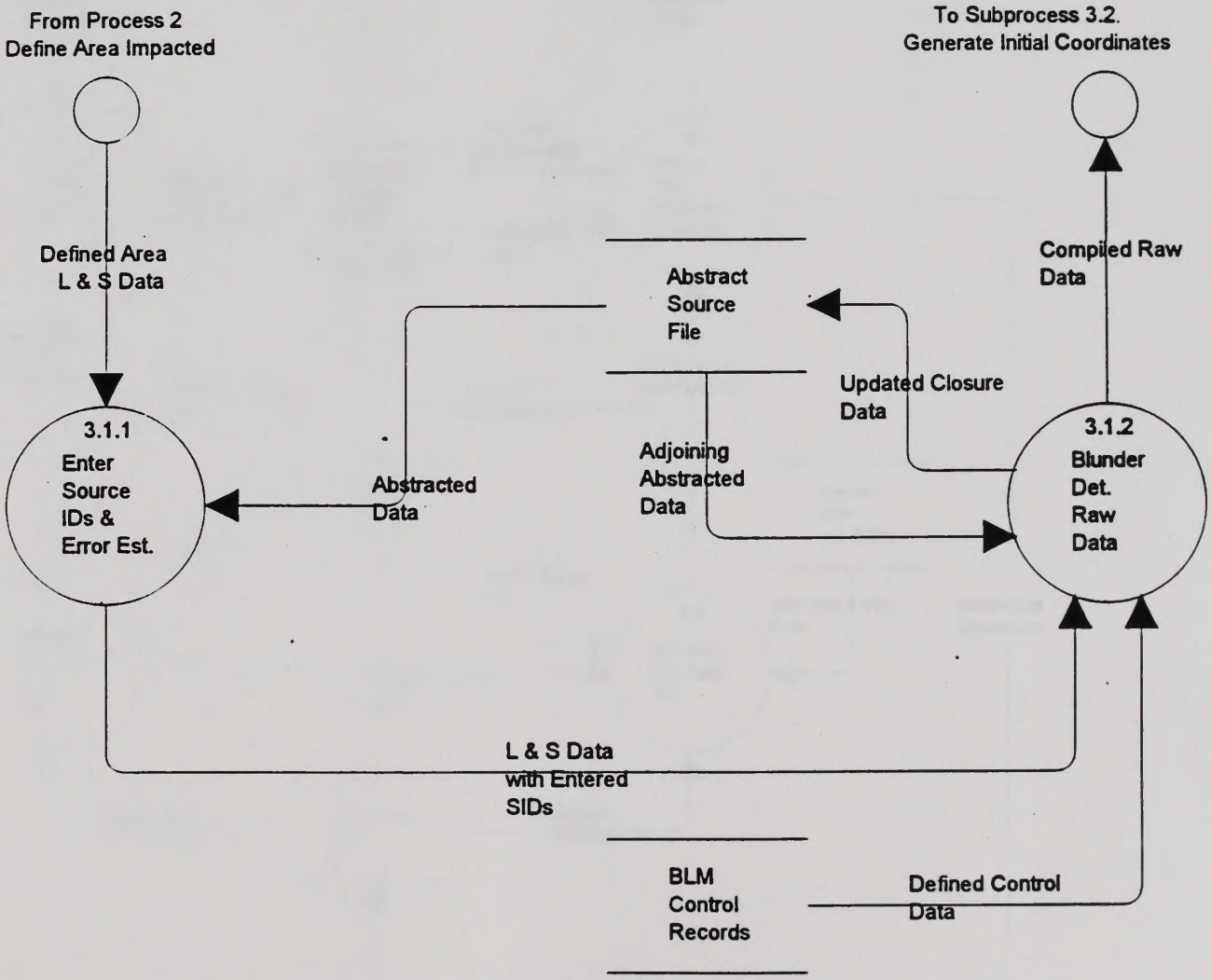
Project Name:	Cadastral Survey Reengineering
Project Path:	c:\ecwin\gcdb2\
Chart File:	gcdba12.dfd
Chart Name:	Data Entry
Created On:	May-23-1995
Created By:	John Farnsworth
Modified On:	Jun-19-1995
Modified By:	John Farnsworth



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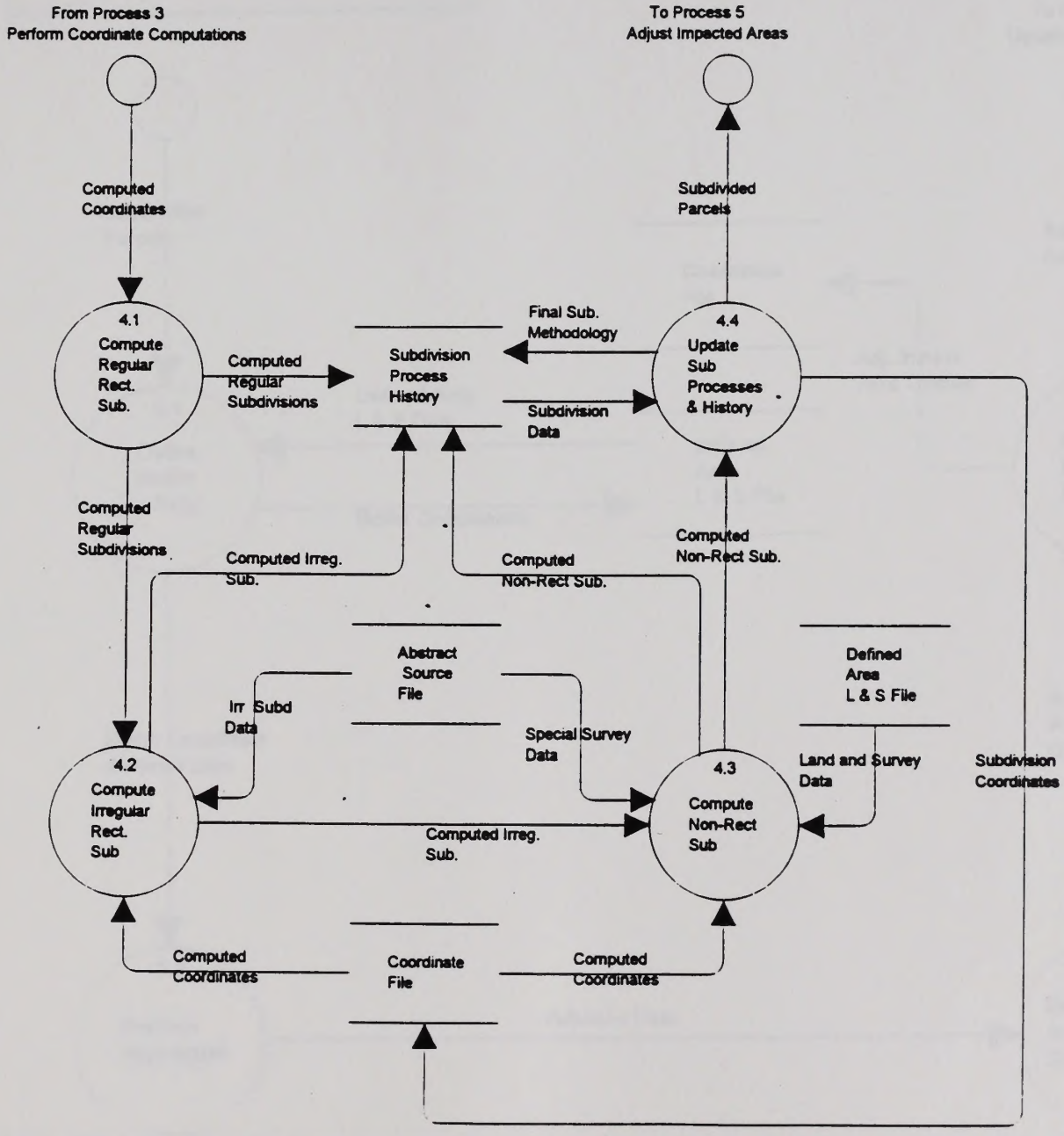
Project Path:	c:\ecwin\gcdb2\
Chart File:	gcdba14.dfd
Chart Name:	Perform Subdivisions
Created On:	May-23-1995
Created By:	John Farnsworth
Modified On:	May-25-1995
Modified By:	John Farnsworth



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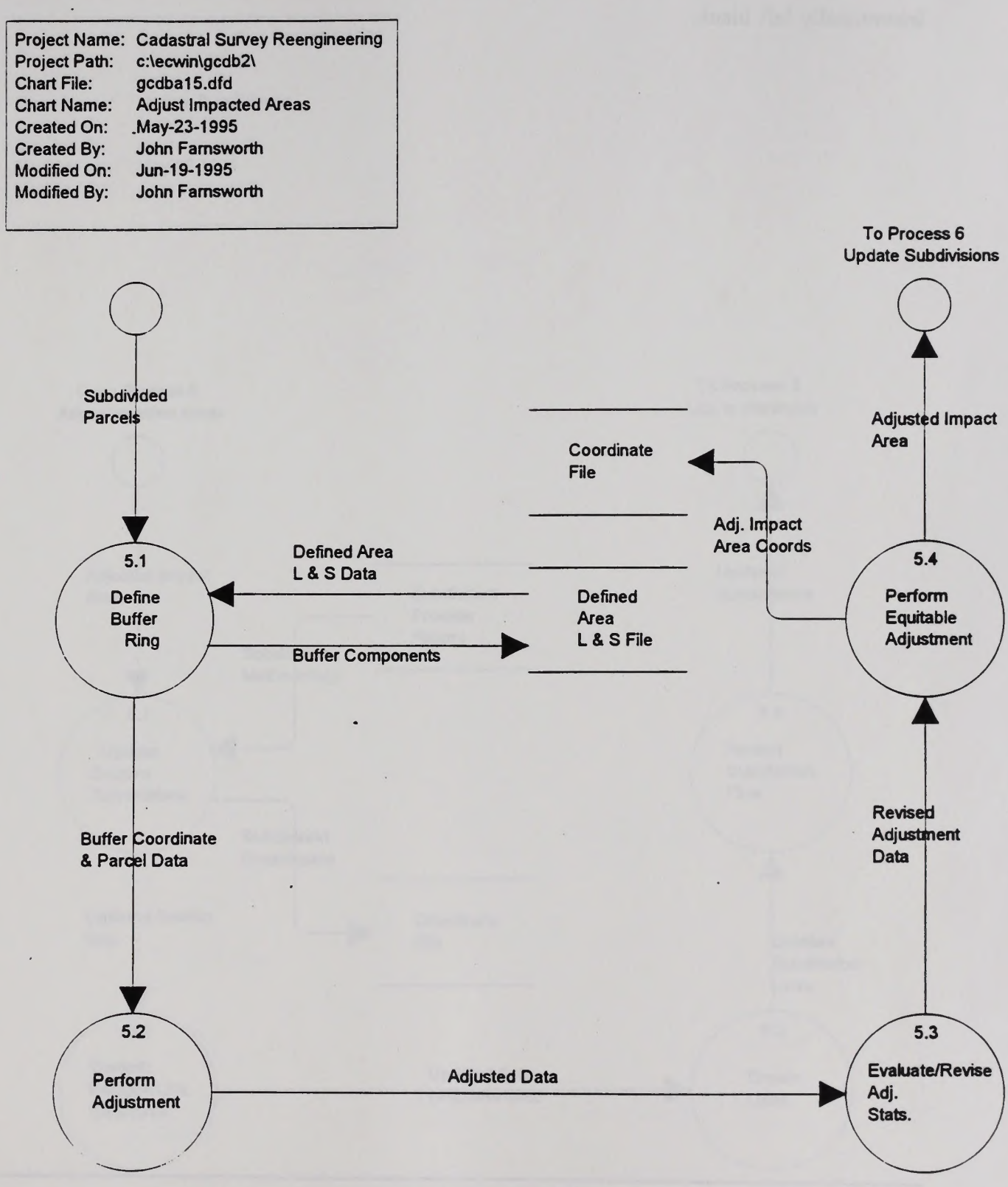
Project Name: Cadastral Survey Reengineering
Project Path: c:\ecwin\gcdb2\
Chart File: gcdba15.dfd
Chart Name: Adjust Impacted Areas
Created On: May-23-1995
Created By: John Farnsworth
Modified On: Jun-19-1995
Modified By: John Farnsworth
To Process 6
Update Subdivisions
Subdivided
Parcels
Coordinate
File
Adjusted Impact
Area
Adj. Impact
Area Coords
5.1
Define
Buffer
Ring
Defined Area
L & S Data
Defined
Area
L & S File
5.4
Perform
Equitable
Adjustment
Buffer Components
Buffer Coordinate
& Parcel Data
Revised
Adjustment
Data
5.2
Perform
Adjustment
Adjusted Data
5.3
Evaluate/Revise
Adj.
Stats.

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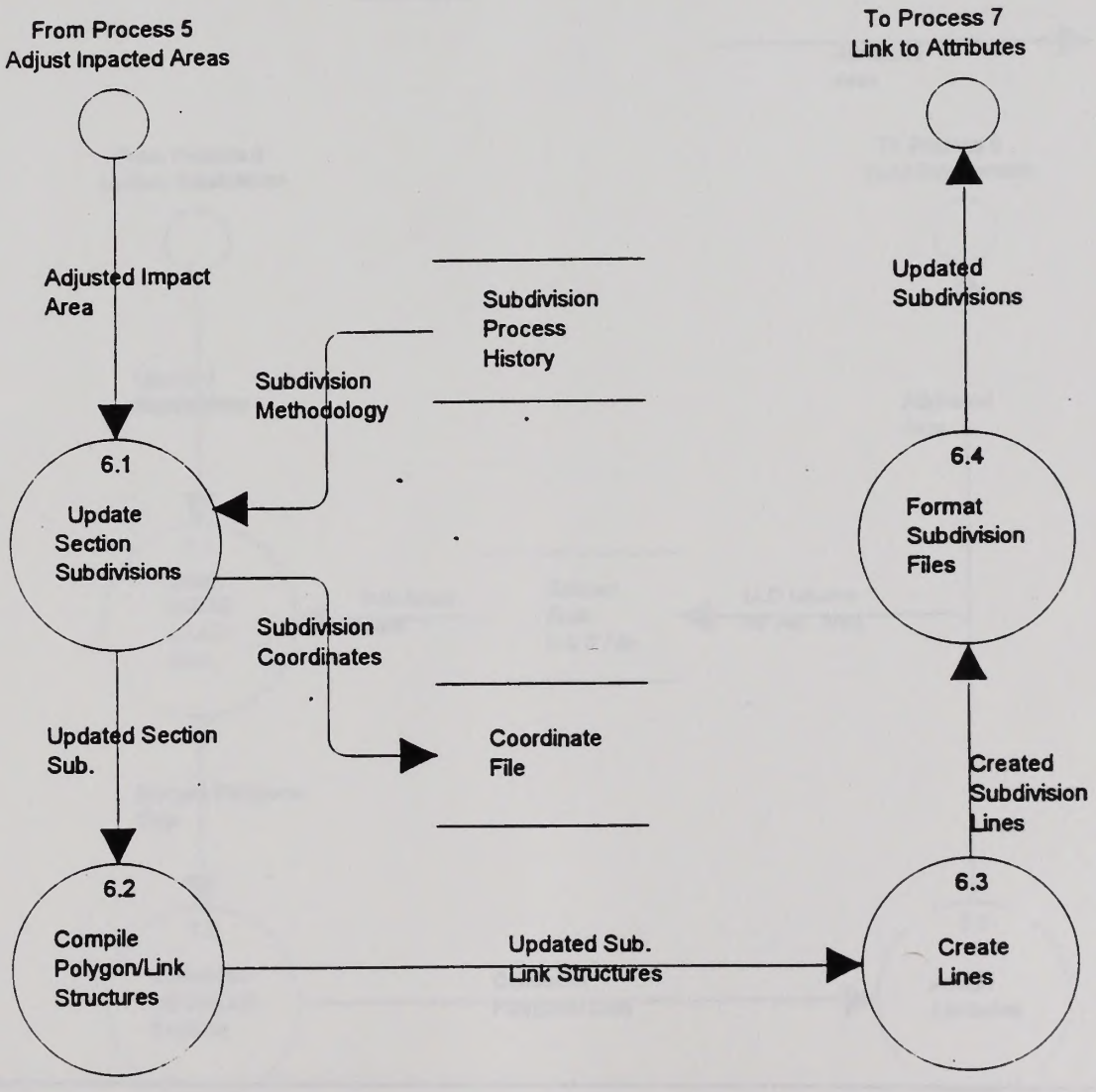
Project Name:	Cadastral Survey Reengineering
Project Path:	c:\ecwin\gcdb2\
Chart File:	gcdba16.dfd
Chart Name:	Update Subdivisions
Created On:	May-23-1995
Created By:	John Farnsworth
Modified On:	May-25-1995
Modified By:	John Farnsworth



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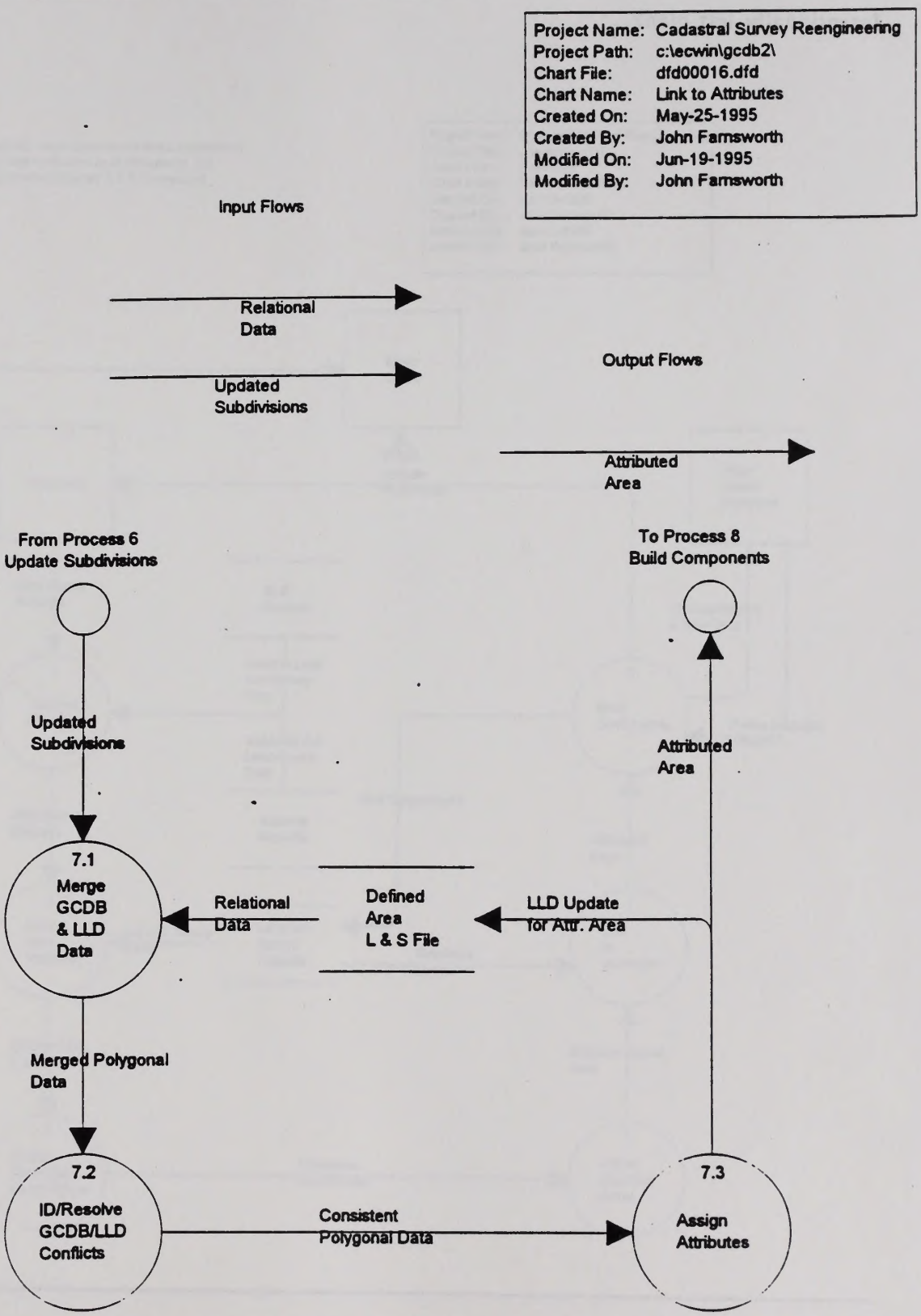
Project Name: Cadastral Survey Reengineering
Project Path: c:\ecwin\gcdb2\
Chart File: dfd00016.dfd
Chart Name: Link to Attributes
Created On: May-25-1995
Created By: John Farnsworth
Modified On: Jun-19-1995
Modified By: John Farnsworth
Input Flows
Relational Data
Updated Subdivisions
Output Flows
Attributed Area
From Process 6 Update Subdivisions
To Process 8 Build Components
Updated Subdivisions
Attributed Area
7.1 Merge GCDB & LLD Data
Relational Data
Defined Area L & S File
LLD Update for Attr. Area
Merged Polygonal Data
7.2 ID/Resolve GCDB/LLD Conflicts
Consistent Polygonal Data
7.3 Assign Attributes

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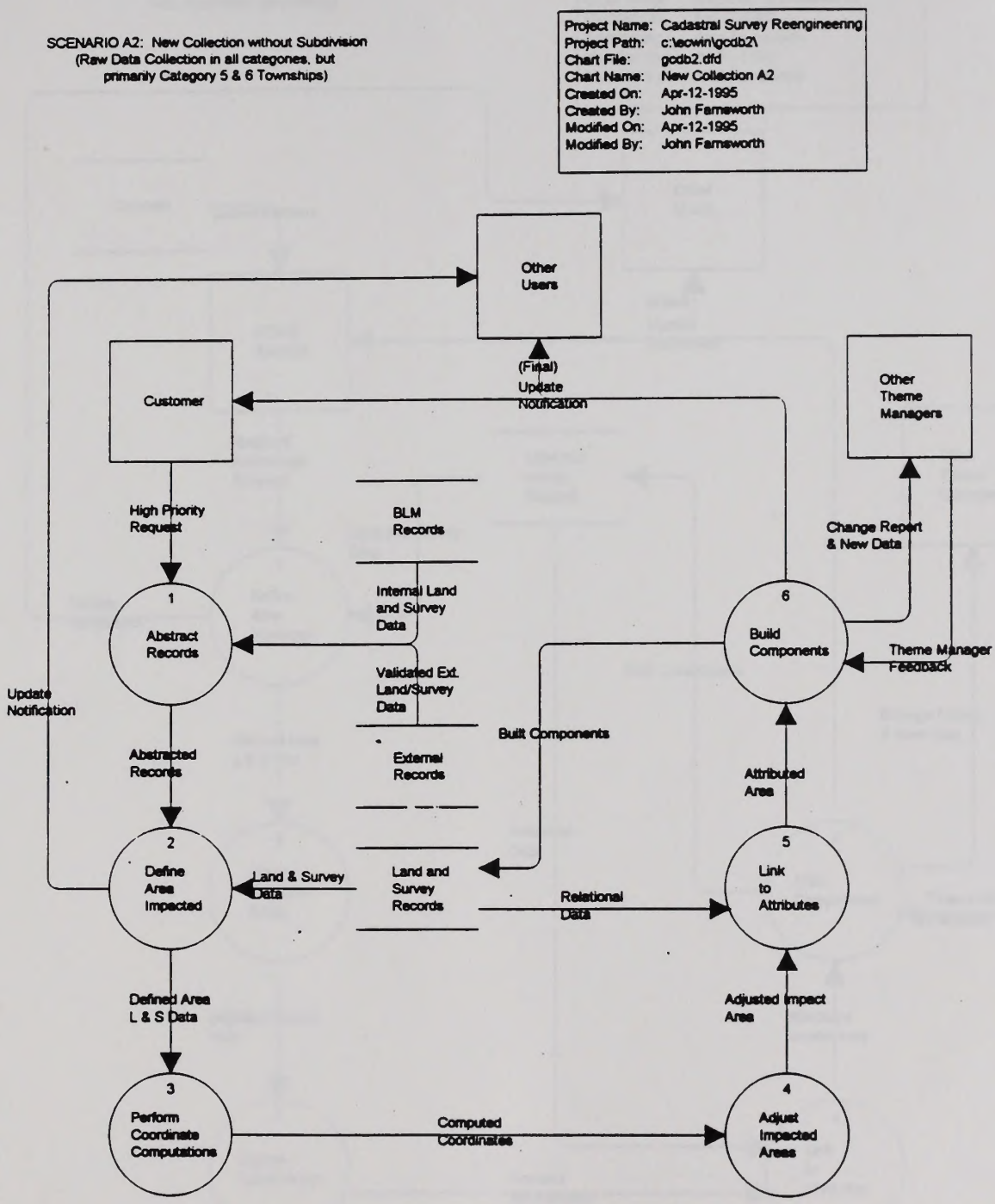
SCENARIO A2: New Collection without Subdivision
(Raw Data Collection in all categones, but
primanly Category 5 & 6 Townships)
Project Name: Cadastral Survey Reengineering
Project Path: c:\eowin\gcdb2\
Chart File: gcdb2.dfd
Chart Name: New Collection A2
Created On: Apr-12-1995
Created By: John Farnsworth
Modified On: Apr-12-1995
Modified By: John Farnsworth
Other Users
Customer
(Final) Update Notification
Other Theme Managers
High Priority Request
BLM Records
Change Report & New Data
1
Abstract Records
Internal Land and Survey Data
6
Build Components
Theme Manager Feedback
Update Notification
Validated Ext. Land/Survey Data
Built Components
Abstracted Records
External Records
Attributed Area
2
Define Area Impacted
Land & Survey Data
Land and Survey Records
Relational Data
5
Link to Attributes
Defined Area L & S Data
Adjusted Impact Area
3
Perform Coordinate Computations
Computed Coordinates
4
Adjust Impacted Areas

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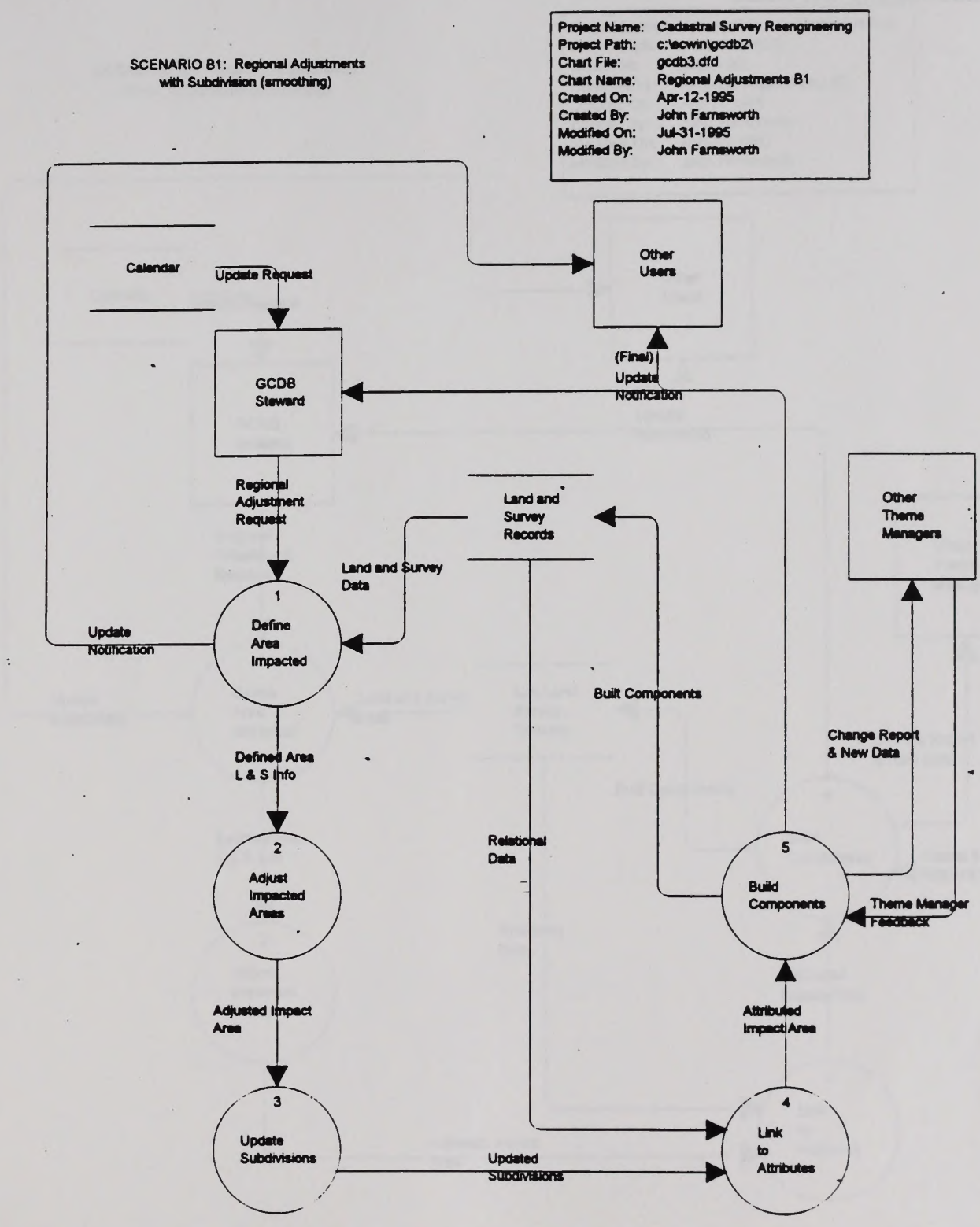
Project Name: Cadastral Survey Reengineering
Project Path: c:\ecwin\gcdb2\
Chart File: gcdb3.dfd
Chart Name: Regional Adjustments B1
Created On: Apr-12-1995
Created By: John Farnsworth
Modified On: Jul-31-1995
Modified By: John Farnsworth
SCENARIO B1: Regional Adjustments with Subdivision (smoothing)
Other Users
Calendar
Update Request
GCDB Steward
(Final) Update Notification
Regional Adjustment Request
Land and Survey Records
Other Theme Managers
Land and Survey Data
1
Define Area Impacted
Update Notification
Built Components
Change Report & New Data
Defined Area L & S Info
2
Adjust Impacted Areas
Relational Data
5
Build Components
Theme Manager Feedback
Adjusted Impact Area
Attributed Impact Area
3
Update Subdivisions
4
Link to Attributes
Updated Subdivisions

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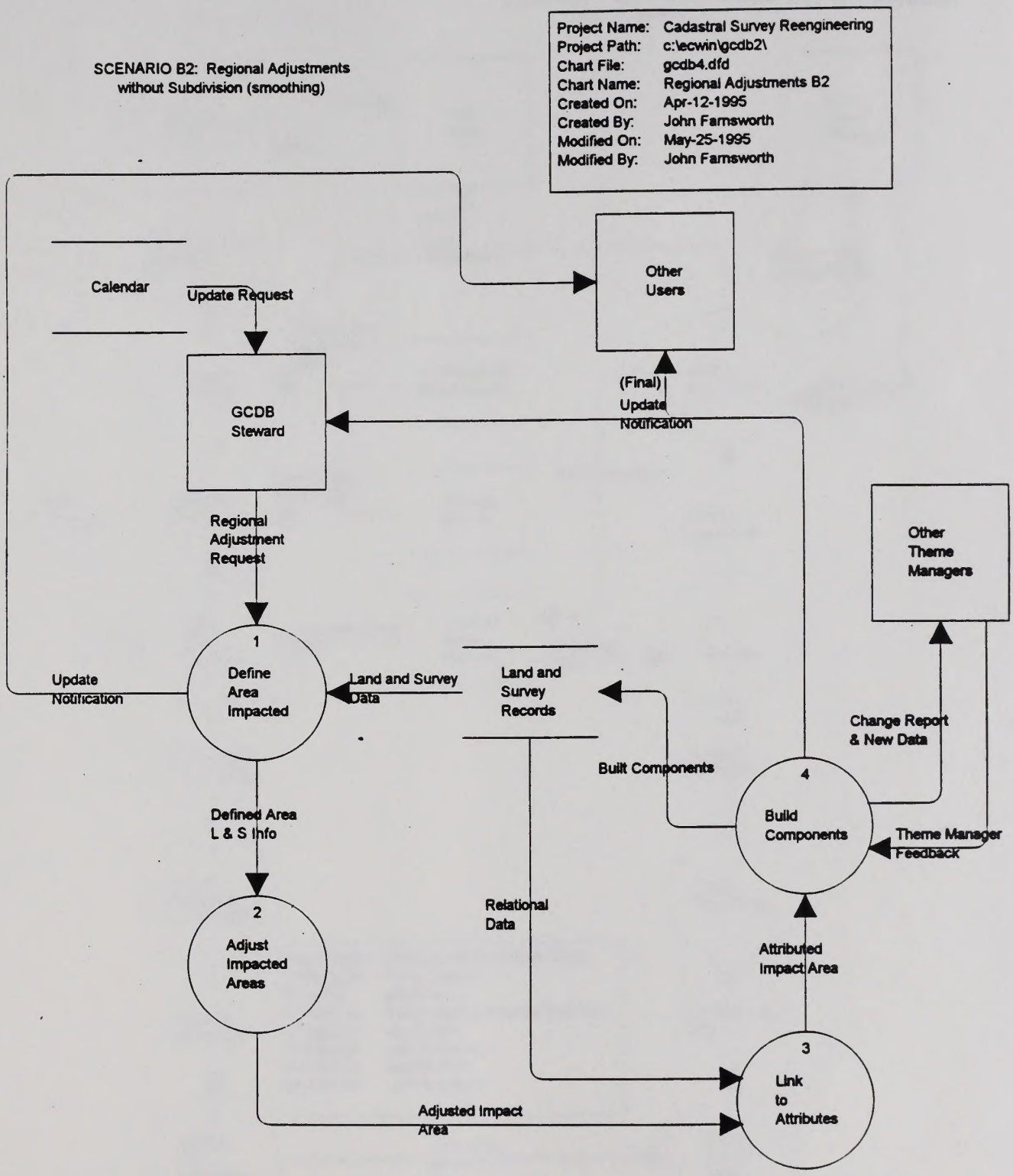
SCENARIO B2: Regional Adjustments
without Subdivision (smoothing)
Project Name: Cadastral Survey Reengineering
Project Path: c:\ecwin\gcdb2\
Chart File: gcdb4.dfd
Chart Name: Regional Adjustments B2
Created On: Apr-12-1995
Created By: John Farnsworth
Modified On: May-25-1995
Modified By: John Farnsworth
Calendar
Update Request
Other Users
GCDB Steward
(Final) Update Notification
Regional Adjustment Request
Other Theme Managers
1
Define Area Impacted
Update Notification
Land and Survey Data
Land and Survey Records
Change Report & New Data
Built Components
4
Build Components
Theme Manager Feedback
Defined Area L & S Info
2
Adjust Impacted Areas
Relational Data
Attributed Impact Area
3
Link to Attributes
Adjusted Impact Area

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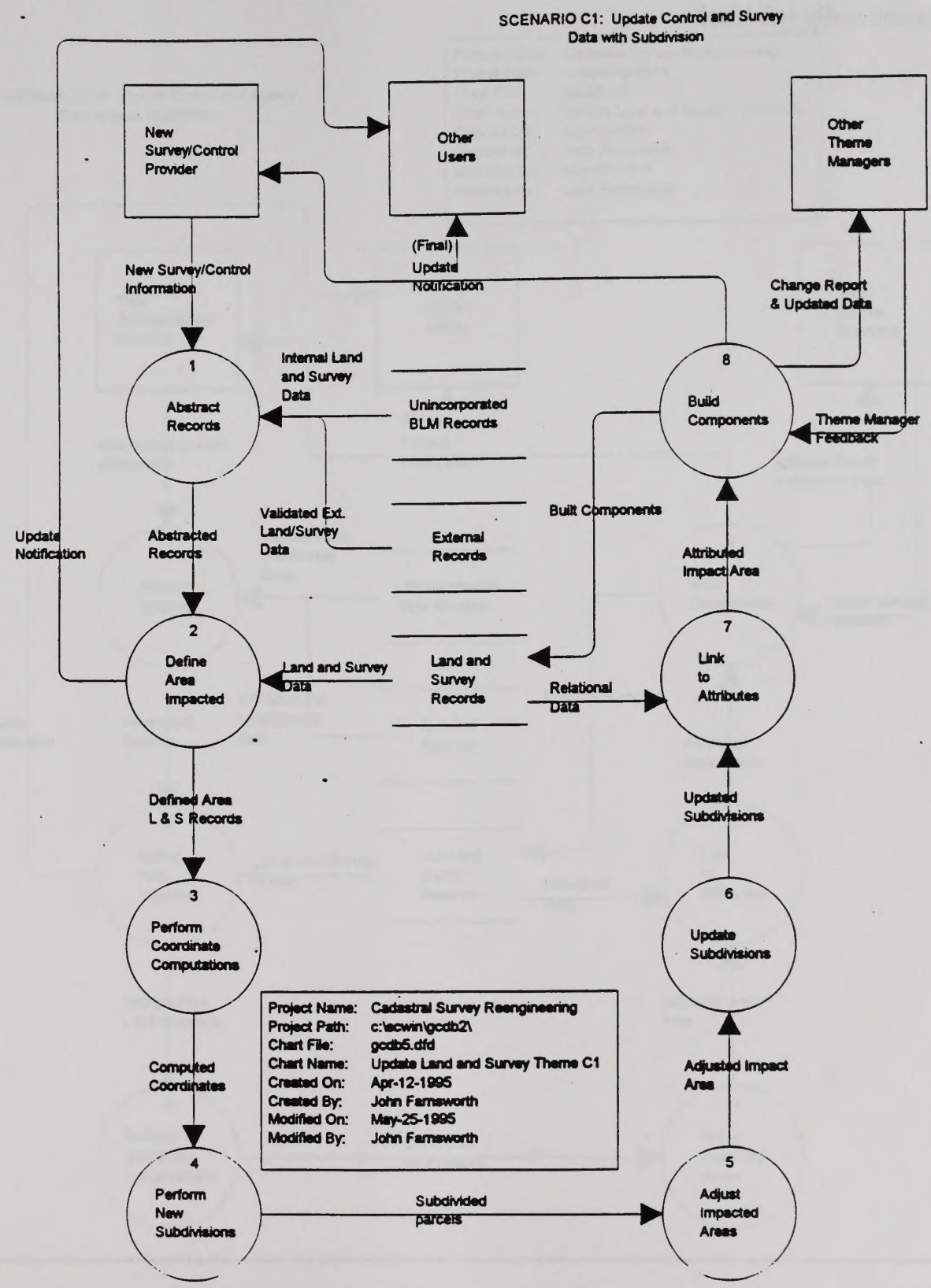
SCENARIO C1: Update Control and Survey Data with Subdivision
New Survey/Control Provider
Other Users
Other Theme Managers
New Survey/Control Information
(Final) Update Notification
Change Report & Updated Data
1
Abstract Records
Internal Land and Survey Data
Unincorporated BLM Records
8
Build Components
Theme Manager Feedback
Validated Ext. Land/Survey Data
External Records
Built Components
Update Notification
Abstracted Records
Attributed Impact Area
2
Define Area Impacted
Land and Survey Data
Land and Survey Records
Relational Data
7
Link to Attributes
Defined Area L & S Records
Updated Subdivisions
3
Perform Coordinate Computations
6
Update Subdivisions
Project Name: Cadastral Survey Reengineering
Project Path: c:\ecwin\gcdb2\
Chart File: gcdb5.dfd
Chart Name: Update Land and Survey Theme C1
Created On: Apr-12-1995
Created By: John Farnsworth
Modified On: May-25-1995
Modified By: John Farnsworth
Computed Coordinates
Adjusted Impact Area
4
Perform New Subdivisions
Subdivided parcels
5
Adjust Impacted Areas

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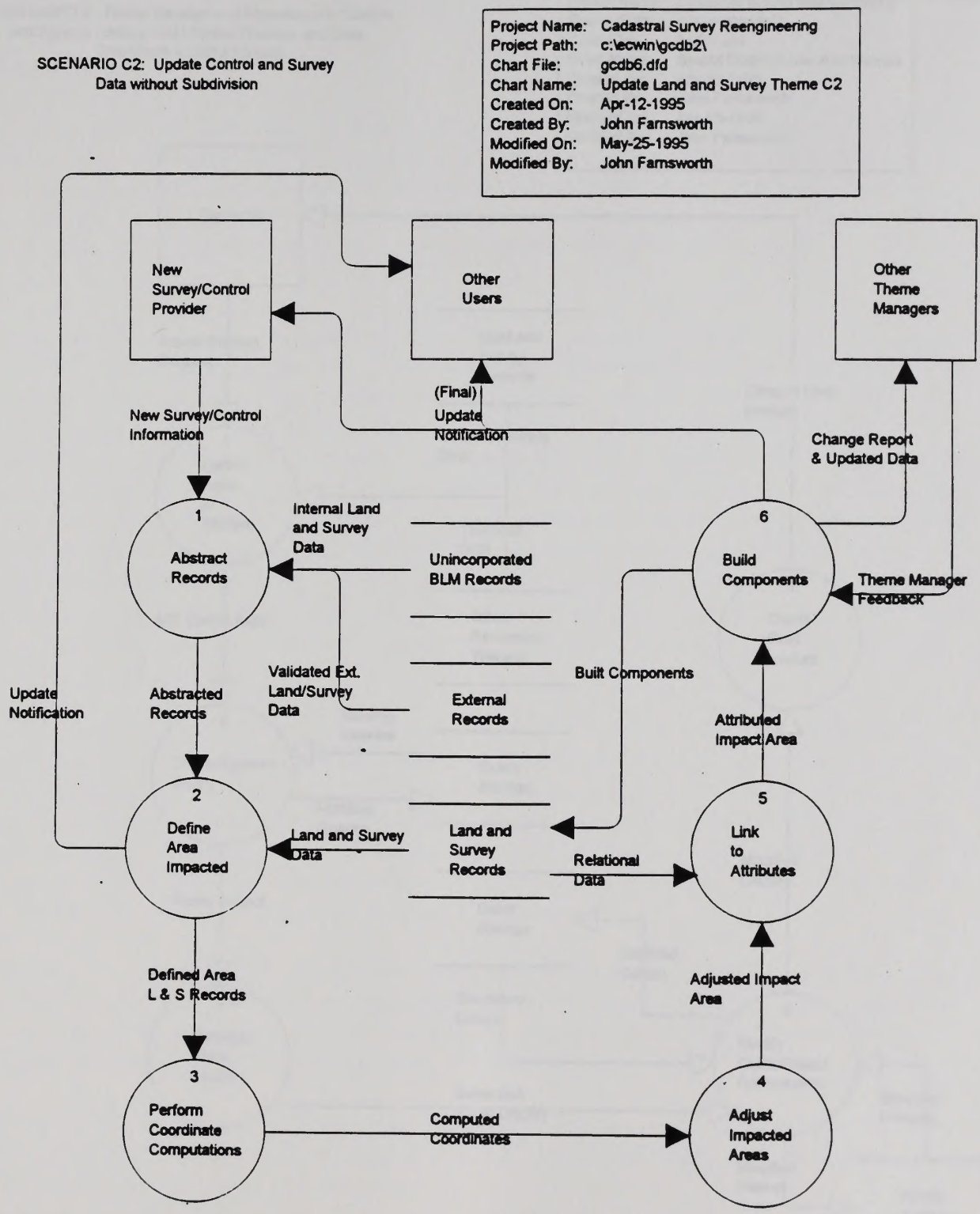
SCENARIO C2: Update Control and Survey Data without Subdivision
Project Name: Cadastral Survey Reengineering
Project Path: c:\ecwin\gcdb2\
Chart File: gcdb6.dfd
Chart Name: Update Land and Survey Theme C2
Created On: Apr-12-1995
Created By: John Farnsworth
Modified On: May-25-1995
Modified By: John Farnsworth
New Survey/Control Provider
Other Users
Other Theme Managers
New Survey/Control Information
(Final) Update Notification
Change Report & Updated Data
1
Abstract Records
Internal Land and Survey Data
Unincorporated BLM Records
6
Build Components
Theme Manager Feedback
Update Notification
Abstracted Records
Validated Ext. Land/Survey Data
External Records
Built Components
Attributed Impact Area
2
Define Area Impacted
Land and Survey Data
Land and Survey Records
Relational Data
5
Link to Attributes
Defined Area L & S Records
Adjusted Impact Area
3
Perform Coordinate Computations
Computed Coordinates
4
Adjust Impacted Areas

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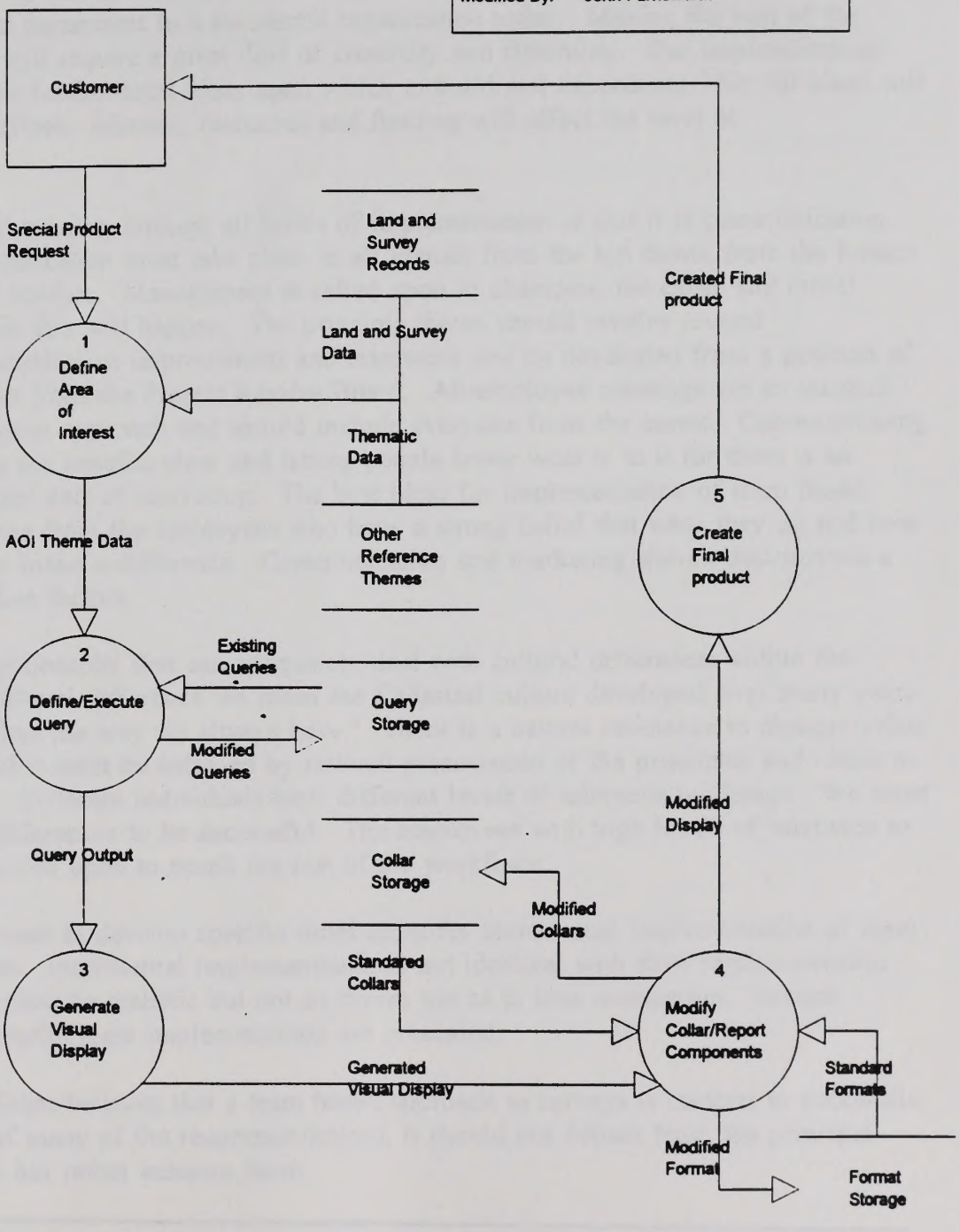
SCENARIO E: Spatial Displays and Alphanumeric Queries and Reports (Unique O&M Spatial Displays and Data Downloads in GMM Format)

Project Name:	Cadastral Survey Reengineering
Project Path:	c:\ecwin\gcdb2\
Chart File:	gcdb7.dfd
Chart Name:	Spatial Displays and A/N Queries
Created On:	Apr-12-1995
Created By:	John Farnsworth
Modified On:	Apr-13-1995
Modified By:	John Farnsworth



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Implementation Goals and Strategic Plan

Introduction

Focus and clarity of vision have shown the Core Team that change and reengineering are not options. They are paramount to a successful organization today. Making the best of the situation at hand will require a great deal of creativity and flexibility. Our implementation plan presents some fundamental ideas upon which to build and experiment. Not all ideas will be useful to all offices. Mission, resources and funding will affect the level of implementation.

A common thread running through all levels of implementation is that it is communication intensive. Communication must take place in all arenas; from the top down, from the bottom up and across all borders. Management is called upon to champion the cause and initial indications are that this will happen. The principle theme should revolve around communication, continuous improvement and teamwork and be developed from a position of unanimous support from the Project Review Board. All-employee meetings are an integral part of this champion approach and should include everyone from the outset. Communicating the goals, making the benefits clear and letting people know what is in it for them is an extremely important part of marketing. The best ideas for implementation of team based strategies will come from the employees who have a strong belief that what they do and how they respond does make a difference. Communication and marketing should demonstrate a sensitivity to human factors.

There is no one philosophy that can adequately deal with cultural differences within the workforce. By cultural difference we mean the Cadastral culture developed over many years of doing things "just the way we always have." There is a natural resistance to change within the human spirit that must be softened by rational presentation of the principles and ideals to which we aspire. Different individuals have different levels of tolerance to change. We must recognize these differences to be successful. The employees with high levels of tolerance to change must be relied upon to coach the rest of the workforce.

Each office will need to develop specific timeframes for incremental implementation of team based philosophies. Incremental implementation is not identical with slow implementation. The time frames must be realistic but not so drawn out as to lose momentum. Several examples of successful team implementation are presented.

While the Core Team believes that a team based approach to surveys is integral to successful implementation of many of the recommendations, it should not detract from the principal recommendations but rather enhance them.

Recommendations, Discussion and Actions

Team Based Survey Execution

Recommendation

Immediately begin to assess probabilities of implementing team based philosophies in the preparation for, execution of and final production of surveys and survey records.

Discussion

The main emphasis is building the quality into the survey from the beginning and having a committee or group of individuals that are involved in and responsible for the survey from the initiation of the survey request. This recommendation comes directly from the results of the Applied Structures Analysis of our Cadastral Survey business events. It incorporates the findings and recommendations outlined previously in the Team Concept, Integrated Product Review Procedures and Multi-tasking of Land Surveyors sections of this report.

Teams of technical experts will be put together and assigned specific surveys to complete. Each team will consist of all the individuals required to investigate, execute, advise and produce the final survey record. Teams may vary depending on location of members, complexity of the assigned project, funding and availability of technical support and resources. Therefore, this report does not attempt to dictate the appropriate team makeup for any particular state office. However, the recommendation of the Core Team is to eliminate the traditional pipeline process of completing surveys.

The matrix presented on page 134 used in conjunction with the Pilot Project reports on pages 42 and 48 outline several options for implementation.

Action

Each Cadastral office will prepare and present an implementation plan to their respective State Directors by March 1, 1996.

Format of the Base Product

Recommendation

Produce all future survey products in the format outlined previously in this document.

Actions

Each Cadastral Survey office shall produce two final documents in the new format as prescribed (one plat only survey and one set of modified field notes and plat). These products will be presented and discussed at the quality Assurance Meeting currently scheduled for January, 1996. This set of final documents can be reworked versions of previously approved surveys or of new unapproved survey records. It should not be a fictitious survey.

Implementation of the new base product format should be completed in all states on all new survey projects initiated after April 1, 1996. This will substantially affect our ability to produce more timely survey products.

Software Development and Documentation

Recommendations

Produce upgraded and standardized versions of cadastral survey software complete with documentation. This should include CMM, GMM and CEFB at the very minimum. Should commercial products be available, they should be thoroughly researched as viable alternatives.

Discussion

A fixed number of Cadastral computer specialists (individuals well versed in CMM and GMM) should be detailed to Jerry Wahl's staff (Eastern States Office). These individuals would be assigned specific areas of responsibility and given specific timeframes for project completion and be held accountable for their results. These people would not necessarily reside in Washington, D.C. Each team and/or individual will assess the requirements of communication and/or co-location and advise the Project Review Board of their recommendations. The possibility exists for contracting this work to private software development firms should the team find this avenue to be more expedient and/or cost effective.

This recommendation will take substantial commitment from states with the quality of individuals necessary to accomplish the assigned task. Funding should be pooled with each state contributing.

Actions

Identify team members by January 1, 1996.
Develop individual product timelines based on recommendations of the team.
Complete the recommended products by January 1, 1997.

Training Relative to Automation

Recommendation

Training issues need to be developed on par with software development.

Action

Assign training coordination duties to those individuals identified to develop software and documentation. Coordination should take place between the Team and the Phoenix Training Center staff. Utilization of the PTC staff or commercial training vendors should be optimized.

Timeframes should be commensurate with development and/or adoption of new technology.

Geographic Coordinate Data Base Operations and Maintenance

Recommendation

Establishment of the GCDB O&M functions as detailed in this report should be actively pursued and sponsored by the Project Review Board and Washington Office Geographic Sciences Team to full implementation.

Discussion

Upper level management needs to be informed of the scope of O&M, its growing potential to support many applications, such as GIS, mapping, and land and resource management; and its significant contribution to national spatial data efforts.

Within the body of this report there are many implementation steps detailed in the seven

findings and recommendations on GCDB O&M. It probably can't be emphasized enough that all this work is futuring as the BLM has not actually performed this kind of work previously.

The biggest problem is the perception by many within BLM that the GCDB will be complete at the end of FY 96 and no more resources will need to be devoted to it. Initial collection is only scheduled for completion in township categories 1 through 4. Townships in categories 5 and 6, the most difficult townships to collect - and in many cases those with the most conflicts in resource use - are not scheduled. Collection for border states has also not been scheduled and will need to be completed using partnership agreements. As previously detailed, there will also be considerable work in data conversion required to incorporate this information in the corporate data base.

Other factors in the continuation of GCDB work include the provisions in EO 12906, which mandates the maintenance of all data bases created in connection with the NSDI. For continued usefulness of this data, it will need to be updated with the most recent control and survey information available.

Actions

Handoff to the Denver/Washington Office GCDB Team should be made as soon as feasible following receipt of this report. DWO GCDB will be provided a copy of this report.

Access to Cadastral Survey Records

Recommendation

In line with Supplemental Issue No. 33, continue investigation relevant to producing official survey records on CD-ROM or similar digital medium for storage and retrieval.

Action

Convey Cadastral Survey's interest and need in pursuing this recommendation to the BLM Electronic Imaging Workgroup. This workgroup's Charter clearly defines their responsibilities in this arena. Forward a request to the Imaging Workgroup by December 1, 1995. Refer to the Appendix for a copy of the Workgroup Charter.

Manual of Surveying Instructions Rewrite and Production of the 9600 Administrative Manual

Recommendation

As agreed to previously, the Project Review Board will discuss this issue following implementation and testing of the previous NPR Lab recommendations.

Actions

A strategic plan and implementation schedule for the Manual rewrite should be developed by the Project Review Board by January 1, 1997.

Implementation of the 9600 Manual should begin January 1, 1996 and be completed for submission to and review by the Geographic Science Team by July 1, 1996.

The Future of The NPR Effort

Recommendation

Creation of a Steering Committee

Discussion

The present NPR Core Team has made great strides in evaluating our current processes and making sound recommendations based on our findings. However, there are issues unresolved; there are projects unfinished; there are improvements to be made continuously. The Core Team wants their efforts to continue to positively affect the Cadastral Survey mission. To this end, a team of 5-8 self-motivated individuals should be assigned to a Steering Committee to assure timeframes and commitments are met. These assignments should rotate on a two year basis. New issues will surface as we try new things and learn about as yet undeveloped technologies. This team could be responsible for training, technology and issue resolution.

Action

The Project Review Board should consider this issue and make recommendations by February 1, 1996.

Team Based Implementation Schedule

(sample timeline, months may be shifted either way; categories may be changed, deleted and/or added to)

ACTION	J	F	M	A	M	J	J	A	S	O	N	D
All Employee Meeting	●											
Champion Approach	●											
Communication Strategy Marketing	●	●	●	●	●	●	●	●	●	●	●	●
Team Training and Development		●	●	●	●	●	●	●	●	●	●	●
Define Resident Support*			●									
Define QA/QC Functions			●									
Define State Office Team Implementation Timetable			●									
Determine Team Makeup				●								
Assign Team Responsibilities					●	●	●	●	●	●	●	●

*Existing physical resources, technical resources, funding, human resources, etc.

Implementation Matrix

Recommendation	Action	Timeframe
Team based survey execution	Present an implementation plan to all respective State Directors	March 1, 1996
Format of the base product	Produce all future survey products in the format outlined previously in this document	April 1, 1996
Software development and documentation	Produce upgraded and standardized versions of cadastral survey software complete with documentation.	Identify team by January 1, 1996 Complete project by January 1, 1997
Training relative to automation	Assign training coordination duties to the Software Development Team (see above).	Commensurate with development of new technology (see above)
GCDB O&M	Handoff and establish recommended GCDB O&M functions.	ASAP & as IOC is developed and implemented
Pursue CD-ROM storage and retrieval capability for official cadastral survey records. Wyoming State Office should be considered for a pilot project.	Forward a request for assistance to the BLM Electronic Imaging Workgroup.	December 1, 1995
Manual of Surveying Instructions rewrite and production of the 9600 Administrative Manual	A strategic plan and implementation schedule to be developed by the PRB Rewrite of the 9600 Manual Submit for review/approval	January 1, 1997 Begin January 1, 1996 Complete July 1, 1996
The future of the NPR effort	Project Review Board should consider this issue and make recommendations.	February 1, 1996

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Form 1279-3
(June 1984)

BORROWER

TA 622 .C322 1995 v.1 c.2

Cadastral Survey Reinvention
Laboratory : reinventing

DATE LOANED	BORROWER

USDI - BLM

TA 622 .C322 1995 v.1 c.2

Cadastral Survey Reinvention
Laboratory : reinventing